

# REPORT DOCUMENTATION PAGE

AFRL-SR-AR-TR-06-0041

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 26 January 2006		3. REPORT TYPE AND DATES COVERED Final; 1 December 2002 - 30 November 2005	
4. TITLE AND SUBTITLE  Spacewatch Survey for Asteroids and Comets				5. FUNDING NUMBERS AFOSR Grant F49620-03-1-0107	
6. AUTHOR(S)  Robert S. McMillan and the Spacewatch Team					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Arizona Steward Observatory 933 North Cherry Avenue Tucson, AZ 85721-0065				8. PERFORMING ORGANIZATION REPORT NUMBER FRS 330820	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U. S. Air Force: AFOSR/NM Suite 325, Room 3112 875 North Randolph Street Arlington, VA 22203-1768				10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES  Attn.: Major David Byers, PhD, AFOSR/NM, <a href="mailto:david.byers@afosr.af.mil">david.byers@afosr.af.mil</a> , 703/696-8411					
12a. DISTRIBUTION / AVAILABILITY STATEMENT  UNCLASSIFIED, UNRESTRICTED				12b. DISTRIBUTION CODE  <b>DISTRIBUTION STATEMENT A</b> Approved for Public Release Distribution Unlimited	
13. ABSTRACT (Maximum 200 Words) Low-light-level telescopic imaging observations of the night sky were made with the 0.9-meter and 1.8-meter Spacewatch Telescopes on Kitt Peak mountain in the Tohono O'odham Nation, Arizona. Small bodies in the solar system were discovered and followed to improve knowledge of their orbits and analyze the distribution of their absolute magnitudes. During this grant interval, a total of 6,620 positional measurements of 1,352 Earth-approaching Asteroids (EAs) were made, 200 of which were objects newly discovered by this project. The other EAs were observed to improve their orbits. Spacewatch also discovered 5 Centaurs or Scattered Disk Objects, 3 Trans-Neptunian Objects (TNOs), and 12 comets during this report interval. The 0.9-meter telescope was automated during this grant interval, allowing unattended operation. The number of detections of EAs and the area of sky covered allowed a new determination of the number of EAs with absolute magnitudes $\geq 22$ and their distribution with absolute magnitude to be made. New collaborations were formed between Spacewatch and the USAF-funded Pan-STARRS project in Hawaii and the NASA-funded WISE spacecraft mission. Updates on loose associations with a program of asteroid photometry in NW Australia, and astronomers in Mongolia are also given. Spacewatch is described at <a href="http://spacewatch.lpl.arizona.edu">http://spacewatch.lpl.arizona.edu</a> .					
14. SUBJECT TERMS Asteroids. Space. Surveillance. Telescope. Camera. Survey. Orbit. Astronomy				15. NUMBER OF PAGES	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED, UNRESTRICTED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED, UNRESTRICTED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED, UNRESTRICTED		20. LIMITATION OF ABSTRACT  NONE	

FINAL REPORT for GRANT  
# F49620-03-1-0107  
to the  
University of Arizona  
Steward Observatory  
from the  
U. S. Air Force Office of Scientific Research

Title: **Spacewatch Survey for Asteroids and Comets**

Duration of Grant: 1 December 2002 - 30 November 2005

Dates Reported on: 1 December 2002 - 30 November 2005

---

Principal Investigator: Robert S. McMillan

Date

PI Location: University of Arizona  
Lunar and Planetary Laboratory  
Kuiper Space Sciences Building  
1629 East University Boulevard  
Tucson, AZ 85721  
Phone: 520/621-6968  
FAX: 520/621-1940  
Email: bob@lpl.arizona.edu

20060309 064

c:\bob\_d\sw\dod\afosr\AFfinal\_06.wpd

**DISTRIBUTION STATEMENT A**  
Approved for Public Release  
Distribution Unlimited

## **ABSTRACT of Original Proposal in May 2002:**

**Overview:** The Spacewatch Project, begun at The University of Arizona in 1980, is an exploration of the various populations of small objects throughout the solar system, from the orbit of the Earth to beyond the orbit of Neptune. Spacewatch provides information on the distributions of asteroids as functions of orbital parameters and absolute magnitude, finds interesting targets for space missions, and finds objects that might present a hazard to the comfortable environment we enjoy on Earth. Spacewatch is described at <http://www.lpl.arizona.edu/spacewatch/index.html>, where a list of publications can also be found. This proposed grant will cover about one fifth of Spacewatch's salary and operating expenses for three years.

**Relevance to the AFOSR Mission:** This proposal is addressed to AFOSR's involvement in "...advancing deep space surveillance techniques to observe and track Near Earth Objects....", as stated on page 29 of the October 2001 issue of Research Interests of the AFOSR and Broad Agency Announcement 2002-1. AFOSR's interest in asteroid surveying and astrometry was also stated on pp31-32 of the June 2001 issue of AFRL Technology Horizons magazine.

**Discovery:** Spacewatch will expand and accelerate its search for new members of all classes of asteroids and comets throughout the solar system. The new, larger (1.8-meter) telescope now provides access to more of the intriguing very small Earth-approaching asteroids, as well as Trans-Neptunian Objects (TNOs). By the time this grant begins, the 0.9-m telescope will have been fitted with a mosaic of CCDs, allowing Spacewatch to detect Earth-approaching Asteroids (EAs) six times faster than it has been doing, up to 300 (new plus old) per year. These will include many EAs larger than 1 km in diameter.

**Recoveries:** EAs tend to be fainter (dimmer) on their return apparitions years after their epoch of discovery because close approaches to Earth are rare. The Spacewatch Project will recover and do astrometry on EAs that are too faint for other observatories.

**Interpretation:** Integration of the size distribution of EAs, combined with corrections for the incompleteness of our survey, will yield a new estimate for the total number of EAs that are large enough to endanger the Earth with their impacts. Their distribution with orbital elements can also help determine the relative contributions from the various dynamical mechanisms replenishing the population of EAs. Finding large (bright) TNOs will provide clues to the extent of accretion of bodies in the outer solar system.

**Overseas Collaborations:** Spacewatch will continue to provide advice and guidance via email on asteroid astrometry and photometry to the Research Center of Astronomy and Geophysics (RCAG) of the Mongolian Academy of Sciences, which operates the Khureltegoot Observatory near the capital city of Ulaanbaatar, and to astronomers at the Learmonth Observatory in Western Australia.

### **STATEMENT OF WORK in Original Proposal, May 2002:**

This grant from AFOSR will fund only about one-fifth of the payroll and operating costs of Spacewatch. Therefore, meeting the obligations enumerated here is subject to Spacewatch receiving the rest of its funding from other sources.

! The search for asteroids will be continued with the Steward Observatory 0.9-m telescope and the Spacewatch 1.8-m telescope.

! Spacewatch will recover known EAs that are in need of updated orbits and are too faint for other observatories. The smaller telescope, with its wider field of view, will be used to recover asteroids with large positional uncertainties. The larger telescope will be used to recover asteroids that are too faint for smaller telescopes. Priority will be given to PHAs, virtual impactors, and objects discovered by Spacewatch.

! We will continue to mine our 1990-1999 data archive for moving objects that were missed by old software.

! All discoveries and astrometric positions will be reported promptly to the International Astronomical Union's Minor Planet Center in Cambridge, Massachusetts.

! Studies of the statistics of the various populations of asteroids will be conducted to analyze their distributions with absolute magnitude and orbital parameters.

! Spacewatch will continue to provide advice and guidance, exclusively via email, on asteroid astrometry and photometry to the Khureltegoot Observatory in Mongolia and to the Learmonth Solar Observatory in NW Australia.

### **EXPECTED RESULTS in Original Proposal, May 2002:**

! Hundreds of detections of EAs (new plus old) should be made by Spacewatch in the course of routine surveying in the next 3 years. This assumes both telescopes will be in heavy use and the mosaic of CCDs will be operational soon after this grant begins on 2002 November 1. Most of the EAs with H#18 detected by Spacewatch will have been too faint at those times for the LINEAR survey (Stokes et al. 2000) to detect in its large-area short-exposure mode of observing.

! The statistical properties of these detections will be presented as constraints on the numbers of EAs with H#22, their distribution with absolute magnitude, the number of PHAs, and on the evolution of EA orbits.

! Some of the recoveries by Spacewatch of EAs with large uncertainties in position and/or faint magnitudes will be unique and will prevent loss of the objects.

! Approximately 80,000 objects, including 12-24 EAs, are expected to be measured for the first time in each year of data prior to 1999 October by reanalysis with new software. All new detections will be sent to the MPC and the pixel data will be converted into a searchable database.

### **SUMMARY OF GRANT EFFORT, 1 DEC 2002 - 30 NOV 2005**

The goals of the Spacewatch Project are to discover small bodies in the solar system and to analyze the distributions of their orbits and absolute magnitudes. Astrometric imaging observations are scheduled on an average of 3 weeks per month with the 0.9-meter and 1.8-meter Spacewatch Telescopes on Kitt Peak mountain in the Tohono O'odham Nation, Arizona. Our discoveries support studies of the Trans-Neptunian, Centaur, Trojan, main belt asteroid, and Earth-approaching (EA) asteroid populations. These studies provide information about the evolution of these objects and their orbits. Spacewatch also observes potential targets for space missions and radar, finds objects that might present a hazard of impact on the Earth, provides accurate astrometry of tens of thousands of asteroids annually, and recovers and does astrometry of high-priority comets and asteroids that are too faint for most other asteroid observing stations.

The 1.8-meter Spacewatch telescope is the largest telescope in the world dedicated exclusively to discovery and astrometry of comets and asteroids. It has a limiting magnitude of  $V=23$ , 4 mags fainter than the LINEAR survey (Stokes et al. 2000). With this telescope, Spacewatch contributed as many observations of faint Potentially Hazardous Asteroids (PHAs) during this report interval as all other observing stations combined.

Since it went into operation, the mosaic of CCDs on the 0.9-m telescope covered in each lunation an average of 1400 square degrees of the most important regions of the sky for EA discovery. Thus Spacewatch's fainter magnitude limits and sensitivity to slower motions permitted comprehensive discovery and followup of EAs at relatively large distances from Earth, thereby helping to complete the survey for hazardous asteroids.

During this grant interval, we made a total of 6,620 positional measurements (2,206 detections) of 1,352 EAs, 200 of which were objects newly discovered by us. We observed the other EAs to improve their orbits. Spacewatch also discovered 5 Centaurs or Scattered Disk Objects, 3 Trans-Neptunian Objects (TNOs), and 12 comets during this report interval.

The 0.9-meter telescope and camera were completely automated during this grant interval, allowing the entire system including the dome to operate unattended all night under computer control.

Newly formed collaborations between Spacewatch and the USAF-funded Pan-STARRS project in Hawaii and the NASA-funded WISE spacecraft mission reflect the usefulness of Spacewatch

for years to come. Updates on loose associations with a program of asteroid photometry in NW Australia, and astronomers in Mongolia are also given. Spacewatch is described at the URL <http://spacewatch.lpl.arizona.edu>.

## BACKGROUND

This grant covered about one fifth of Spacewatch's salary and operating expenses during this report interval. As the AFOSR has elected not to continue funding Spacewatch after 30 Nov 2005, this grant is the last of a series of grants from AFOSR that funded Spacewatch continuously since 1984. Spacewatch continues with funding from NASA and the Chicago-based Brinson Foundation.

**History:** Asteroid surveying with charge-coupled device (CCD) detectors was developed by Spacewatch in the early 1980s. Spacewatch was the first to use CCDs to survey the sky for comets and asteroids, first to do astrometry on an asteroid with a CCD (1984 JZ on 1984 Apr. 28; numbered (3325) after our observation), first to do targeted astrometry of an Earth-approacher (EA) with a CCD (1983 TB, now known as (3200) Phaethon, on 1984 Sep. 22), first to discover asteroids with a CCD, first to use a CCD to discover an asteroid that received a permanent number (the Trojan (3801) Thrasymedes), first to discover an EA with a CCD (1989 UP), first to discover an EA with software (1990 SS; now (11885)), and first to discover a comet with a CCD (125P/1991 R2). Later accomplishments are described below. Spacewatch is also a conscientious and authoritative interface to the media and general public on this discipline and on the issue of the hazard from impacts by asteroids and comets.

**Technique:** Moving objects are discovered by imaging the sky with CCD detector arrays on a 0.9-meter telescope and a 1.8-meter telescope on Kitt Peak. The principles of Spacewatch observing have been described by McMillan and Stoll (1982), Gehrels et al. (1986), McMillan et al. (1986), Gehrels (1991), Rabinowitz (1991), Scotti (1994), Jedicke (1996), Perry et al. (1998), McMillan (1999a,b), McMillan et al. (2000), and McMillan et al. (2005). The two telescopes complement each other, with the 0.9-m and its wider field of view operating in a systematic search pattern near the ecliptic and the narrower-field 1.8-m concentrating on followup of specific targets. Both telescopes= CCDs are filtered to a bandpass of 515-950 nm, with an effective wavelength on typical asteroids of 700 nm. (Spacewatch photometry is still calibrated to the V bandpass for historical reasons.) The image scale on both telescopes is 1.0 arcsec per pixel. Three passes or images are made at short intervals to reveal the motions of objects.

## FACILITIES and EQUIPMENT

**Detectors:** The back-illuminated 2048x2048 CCDs we used with great success at the 0.9-m telescope and which we still use at the 1.8-m telescope were made by Tektronix7 (now Scientific Imaging Technologies, SITE7) of Beaverton, OR). They have high quantum efficiency, noise well below the sky background, and have never malfunctioned for us. For the 0.9-m telescope we now have six grade-one back-illuminated, AR-coated 4608x2048 CCDs from Marconi Applied Technologies, from which we selected the best four for our mosaic system.

**0.9-meter Telescope:** The Director of the Steward Observatory has allocated the Observatory's 0.9-m telescope exclusively to the Spacewatch Project on a long-term basis, on the condition that technical support and maintenance of the telescope and dome be funded by grants obtained by the Spacewatch Project. Spacewatch personnel have rebuilt and upgraded many components and subsystems of this telescope over the years, making it a world-class tool for solar system research. The mosaic of four 2Kx4K thinned, back-illuminated EEV CCDs on the 0.9-meter telescope covers a solid angle of 2.9 square degrees. Observations are made in the Astarimg@ mode. The observing cycle goes as follows. We expose for 120 sec on each position. Each 120 sec exposure is followed by a 97 sec interval to read the CCDs and slew and settle the telescope and dome to the next pointing center. Including overhead such as focusing, longer slews between regions, and other operations, this makes a 4 min cycle per exposure. It takes 26 minutes to cycle once through seven such pointings. We return to each of the seven pointing centers in a Aregion@ three times over 78 minutes. Thereby we search with a time baseline of about 0.9 hours for detecting motion. An area of about 1400 deg<sup>2</sup> near the ecliptic centered on the opposition point is surveyed during each lunation, reaching V=21-22 mag depending on conditions.

**1.8-meter Telescope:** This was built by and for Spacewatch, largely at the expense of AFOSR. The field of view is 0.6x0.6 degrees and the image scale is 1.0 arcsec/pixel on a 2048x2048 CCD. This is the largest telescope known to us that is dedicated exclusively to surveying and astrometry of asteroids and comets. Routine operation of the telescope by solo observers began on 2001 October 16 and improvements to the efficiency of its operation have continued steadily. On 2003 June 18 the 1.8-m primary mirror was realuminized for the first time in 4 years. In early July 2003 the cooling system of the CCD was boosted with greater heat pumping capacity to deal with the hot summers here. In 2004 June, new quieter electronics to read the CCD were installed along with some upgrades to suppress electronic noise from our other equipment, yielding a 0.4 mag improvement in limiting magnitude. Improvements to the hardware & software of the telescope drive systems made during this grant interval enhanced pointing and tracking.

The exposure time for each pass with the 1.8-m telescope is  $136^s / \cos(\text{declination})$ . A typical scan with the 1.8-meter to follow up an EA covers from 0.3 to 1.0 deg<sup>2</sup>. The 1.8-m has reached V=23.3. This telescope is dedicated to followup of faint EAs, with emphasis on PHAs and

objects on the MPC=s NEO Confirmation Page and the JPL and NEODYs impact risk pages. The 1.8-m is also committed to doing lightcurves of Trans-Neptunian Objects (TNOs) in support of a grant from the NASA Planetary Astronomy Program to Scotti.

**Computers:** We are nicely equipped with a multitude of PCs on Kitt Peak and at LPL being used as scientific workstations running Xwindows under Linux. At the telescopes, PCs with various operating systems are used for realtime control of telescopes and CCDs. PCs we use for critical applications are frequently upgraded and replaced as technology improves.

**Image Data Archive:** The Spacewatch archive of observed regions and objects, so essential for our precovery work, now has a streamlined, public interface for displaying the Spacewatch pointing history. Without the expense of placing the imagery online, this is a way for interested parties to find out what data are available. This archive has yielded arc extensions for more than a dozen virtual impactors, 2004 MN4 being the most important example. Images have also been provided for other objects of interest. About 1 Terabyte (TB) of data from the old (1990 Apr 30 - 2002 Apr 22) configuration of the 0.9-meter telescope covers a sky area of 30,000 deg<sup>2</sup> including repetitions. Imagery to date from the Spacewatch 1.8-meter telescope amount to approximately 1.5 TB. Data from the mosaic of CCDs have been accumulated since 2003 Mar 23 and now consist of 4 TB. About 28,000 deg<sup>2</sup> were covered by three passes with the mosaic.

**Spacewatch Laboratory Equipment:** We maintain an extensive collection of state-of-the-art electronic design, fabrication, and test equipment, computer spare parts, electronic components, machine tools, mechanical parts, stock aluminum, and hand tools to support our observing operations and instrument maintenance.

**Steward Observatory Facilities:** In addition to the 0.9-m telescope, Steward Observatory provides electricity, plumbing, and custodial services on Kitt Peak as well as internet connectivity and the use of the dormitory rooms for our observers. We have to pay for our use of the internet.

**Lunar and Planetary Lab (LPL) Facilities:** Our research is conducted in the Kuiper Space Sciences Building, which provides ample office and laboratory space for our work and ethernet connectivity to all offices. LPL also supports mechanical design and fabrication, charged to projects by the hour. The quality of work done for this project has always been excellent. A small but carefully stocked library supports research with reference books, a journal archive, and current subscriptions to relevant journals. The LPL computing facilities feature servers with high-bandwidth Internet connectivity, numerous workstations and remote-mountable peripherals for general use, and software such as C, C++, Fortran, perl, tcl/tk, Pgplot, IDL, IRAF, LaTeX, etc.

**University Facilities:** The University Research Instrumentation Center (URIC) includes an electronics shop, a machine tool and welding shop, a cryogenic liquids facility, a printed circuit laboratory, extensive metal stock, equipment for rent, and a "Rent-a-Tech" program for



temporary skilled labor. The URIC built most of the 1.8-meter Spacewatch telescope. The University Center for Computing and Information Technology provides high-bandwidth Internet connectivity to the outside world, including the Spacewatch Telescope data processing systems on Kitt Peak. The University Science and Engineering Library has a large collection of books and journals, indexes of which can be accessed via the Internet.

**Kitt Peak National Observatory (KPNO) Facilities:** KPNO sells high speed internet access, liquid nitrogen, and meals to us. They also provide maintenance of the grounds, snow plowing, backup electrical power, a cafeteria, and emergency medical and fire services in return for a Joint Use Fee paid by all tenants such as the University of Arizona.

## ACTIVITY REPORT

**Discoveries:** Between 1 Dec 2002 and 30 Nov 2005 inclusive, Spacewatch discovered 200 EAs. That total includes 13 Potentially Hazardous Asteroids (PHAs) with absolute magnitude  $H \leq 22$  and 41 objects that appear or have appeared in the past on the NASA JPL impact risk web site (<http://neo.jpl.nasa.gov/risk/>). A recent notable example is 140-meter-diameter Apollo asteroid 2005 NX55, discovered by Spacewatch on 2005 July 11 and which is listed by NASA/JPL with 85 possible encounters with Earth between the years 2011 and 2102. The Italian NEODyS website at <http://newton.dm.unipi.it/cgi-bin/neodys/neoibo?riskpage:0;main> actually lists 2008 as the next possible close approach of this asteroid. Spacewatch also discovered 12 comets and 8 other objects in the outer solar system during the report period.

### Followup Observations:

Followup of EAs helps to consolidate their orbits as their brightness fades after discovery. Faint followup is also frequently required for recoveries of EAs on subsequent apparitions. We elaborate on recoveries in a later section. Some followup observations by Spacewatch are deliberately targeted and some occur incidentally during surveying. Figure 1 illustrates how Spacewatch's rate of detection of priority EAs improved after the introduction of the 1.8-meter telescope and the replacement of the optics and detector at the 0.9-m telescope.

Between 1 Dec 2002 and 30 Nov 2005, Spacewatch observed and reported 6,620 positions of 1,352 EAs (including 1,774 observations of 415 PHAs with  $H \leq 22$ ) and 696 positions of comets.

Figure 2 illustrates the substantial contribution of Spacewatch relative to the other stations that are active in followup of large PHAs when such objects are faint. Of course Spacewatch also follows up PHAs with absolute magnitudes down to the Minor Planet Center's (MPC's) defining limit of  $H = 22$ ; Figure 3 compares our contributions relative to the rest of the faint followup community.

Objects that appear on JPL's impact risk website are also priorities for Spacewatch followup. Between 1 Dec 2002 and 30 Nov 2005, Spacewatch follow-up observations contributed to the removal of 71 objects from that list. No Spacewatch discovery with  $H \leq 22$  has ever been lost while appearing on that list. In March of 2005, Don Yeomans, Director of the JPL NEO Office, privately asked Spacewatch to follow up an object that had an impact solution for 2005 September 23 with a probability of  $2 \times 10^{-6}$ . 2005 EM30 with  $H = 18.5$  was discovered on 2005 March 7 by LINEAR. Its apparition was closing, hence the urgent request for followup before such an early impact date had to be publicized, with all the attendant implications. Spacewatch contributed to the followup campaign, which resulted in the impact probability first decreasing by 3 orders of magnitude and then the object being removed from the risk page.

## Recovery Observations:

PHAs with uncertain ephemerides are the main focus of targeted Spacewatch recovery work. Some objects become uncertain due to the infrequency of favorable apparitions and/or interference by the Moon or galactic plane. If the object is faint during a return apparition, which is usually the case, recovery is labor intensive and time critical. To streamline the effort, Spacewatch developed a suite of organizational software tools and an observing regimen to assure recovery of a needed PHA even if the window of opportunity is very short.

Table 1. Notable Examples of Spacewatch Recoveries of Uncertain PHAs.

Object	Unc.(deg)	H	V	DOU/MPEC	Arc before search	Arc After	Net O-C
2002 TW55	1	18.0	21.7	MPEC 2005-E54	52d	831d	237"
1990 SM	80	16.2	21.2	DOU 2005-C26	24d	5225d	23022"
1999 VT25	3	21.4	21.5	DOU 2004-U47	26d	1786d	7556"
2000 EV70*	3	20.5	20.9	MPEC 2004-E11	46d	1193d	214"
2001 US16	2	20.2	20.7	MPEC 2004-B68	31d	802d	485"
1998 VS**	4	22.3	21.3	MPEC 2003-Y18	32d	1831d	1581"
2000 UL11	2	20.1	21.9	MPEC 2003-S71	28d	1039d	3320"

\*Trailed, so deliberately done through FMO Project.

\*\*Lost PHA status due to our recovery; H now > 22.

Of particular note is the Spacewatch recovery of 1990 SM, a very lost H = 16.2 PHA that had not been seen since the discovery apparition, 15 years before. The object had windows of opportunity viewable to recovery telescopes nearly every year since discovery, and had more than half a dozen windows reaching brighter than 18 V, viewable by the large surveys, but the windows were very short and occurred when the object was near the galactic plane, so the large surveys had not rediscovered 1990 SM accidentally. Encouraged by earlier Spacewatch successes with less uncertain PHAs (under 5 degrees), Spacewatch developed a plan to recover 1990 SM despite its 80 degree 3-sigma uncertainty. To handle the large uncertainty, Spacewatch developed software to analyze how the magnitude and rate change along lines of variation in order to target areas of an uncertainty ellipse where an object is visible to Spacewatch telescopes. For 1990 SM this meant searching half of the ellipse during one lunation (while the other half was too faint) and the second half during the next lunation. After Spacewatch's initial rediscovery was submitted to the MPC, the MPC immediately posted 1990 SM on the NEO Confirmation Page with an updated ephemeris, allowing another telescope to target it the next day.

Because of our focus on uncertain PHAs rather than just any PHA for which the MPC wants measurements, Spacewatch tends to view a PHA only once or twice, in contrast to other stations that might recover the same object many nights in succession. Therefore we based our plots on

counts of distinct PHAs rather than individual measurements. In addition, there has been some discussion as to the reliability of magnitudes in the asteroid survey community. To minimize the effect of observational errors on scoring our performance, we use ephemeris magnitudes for object classifications in all the tables and figures in this proposal.

All of the objects listed in Table 1 were deliberate recoveries. Many asteroids have short, faint viewing windows making them unsuitable for incidental survey recovery and most of the PHAs in Table 1 fall into this category. We targeted many uncertain PHAs, but in most cases, uncertain objects are not found that far from the expected position. This is evidenced by the fact that, despite Spacewatch's targeting of uncertain PHAs and dominance in recovering  $V > 21$  PHAs (q.v., Figs. 2 & 3), only six faint ( $V > 21$ ) PHAs have been found more than 1500" from their nominal positions, four of which were found by Spacewatch.

**Image Data Archive:** The Spacewatch archive of observed regions and objects, so essential for our precovery work, now has a streamlined, public interface for displaying the Spacewatch pointing history. Without the expense of placing the imagery online, this is a way for interested parties to find out what data are available. This archive has yielded arc extensions for more than a dozen virtual impactors, 2004 MN4 being the most important example. Images have also been provided for other objects of interest. About 1 Terabyte (TB) of data from the old (1990 Apr 30 - 2002 Apr 22) configuration of the 0.9-meter telescope covers a sky area of 30,000 deg<sup>2</sup> including repetitions. Imagery to date from the Spacewatch 1.8-meter telescope amount to approximately 1.5 TB. Data from the mosaic of CCDs have been accumulated since 2003 Mar 23 and now consist of 4 TB. About 28,000 deg<sup>2</sup> were covered by three passes with the mosaic.

**Precoveries, 31 July 2004 - 2 August 2005:** Spacewatch has contributed predisccovery observations of high priority EAs such as 2004 MN4, a PHA whose estimated probability of impact on Earth rose to a record high value of a few percent in 2004 December before we found predisccovery observations in the Spacewatch image archives. We increased 2004 MN4's arc of observations from 190 days to 255 days, enough to reduce the estimate of probability of impact to a much less alarming value. 2004 MN4 now has the permanent designation and name of (99942) Apophis. Other precoveries within the last 3 years total 121 EAs and 3 comets. Twenty-one of the EAs were precovered deliberately by inspecting our image archive and the rest were precovered by the MPC's use of their archive of Spacewatch's incidental astrometry.

### **Incidental Astrometry (IA):**

Between 1 Dec 2002 and 30 Nov 2005, Spacewatch sent 1,584,347 astrometric detections of asteroids to the Cambridge, MA-based Minor Planet Center (MPC) of the International Astronomical Union (IAU). (One "detection" by Spacewatch usually equals three observations of position.) Provisional designations for 58,857 asteroids resulting from those observations have been credited by the MPC to Spacewatch. Most of those are in the main belt, but a few examples of incidental precoveries of interesting objects extracted by the MPC from our IA include 2001 WG<sub>2</sub> (an Apollo of high eccentricity and inclination), 2001 XN<sub>254</sub> (a PHA with  $H=17.5$ ),

periodic comet P/2002 BV, Mars crosser 2002 YK<sub>29</sub>, Amor 2003 HB<sub>6</sub>, comet P/2004 A1, Amor asteroids 2003 OB<sub>4</sub> and 2003 MT, and Apollo asteroid 2003 YO<sub>1</sub>. The MPC also found that Apollo PHA 2003 YK<sub>118</sub> was included among our reprocessed results from the year 1993, predating the discovery by more than a decade. 1994 UG was retired from JPL's impact risk page as a result of additional observations found by the MPC among this new astrometry. During this report period, a total of 39 EAs, 6 comets, and 3 outer solar system objects were found by the MPC in our IA. An additional 83 EAs were in the IA we submitted after reprocessing old (1990-1999) Spacewatch imagery with our new, more sensitive software.

Figures 4(a), (b), and (c) illustrate the sky coverage with the mosaic of CCDs through May 2005. Since 2004 September we have been revisiting the same regions during each lunation to allow slowly-moving distant EAs to reveal their presence; the overprinting of region symbols in Fig. 4(c) illustrates the effect. Spacewatch has sent more than a million astrometric detections of asteroids to the MPC as a result of surveying. Spacewatch IA on file at the MPC will remain a permanent asset to the asteroid science community.

#### **Orbital Linkage Software, 31 July 2004 - 2 August 2005:**

We worked toward taking better advantage of Spacewatch's deep limiting magnitude to find new, large EAs while they are far from Earth, near their aphelia. These EAs include those whose orbits will prevent their discovery by brighter-limited surveys between now and the deadline of 2008. A prototypical orbit of this type would be that of minor planet (719) Albert, whose eccentricity and sidereal/synodic periods make it detectable by brighter-limited surveys only once every 30 years.

Spacewatch, like the upcoming deep surveys, has the limiting magnitude to detect large and distant EAs, but the distance means their sky plane rates "hide them in plain sight" amongst the main belt. We have detected many large distant EAs which were not recognized until the MPC later linked them after a close approach (for example: 2003 MU, 2003 HB<sub>6</sub>, 2004 AE<sub>9</sub>, 2004 HM<sub>1</sub>=1995 SP<sub>4</sub>, and 2004 JW<sub>6</sub>). The current shallow surveys depend critically on close approaches: by the time an EA brightens sufficiently, it is also moving with an easily recognizable rate. Because of the rate-brightness relation, Spacewatch and the new surveys like Pan-STARRS and LSST will not discover many additional large EAs without a linking analysis. Any experience gained by Spacewatch will apply to the next generation of surveys. (See below for a description of our plan to assist the Air-Force-funded Pan-STARRS group in Hawaii.)

The MPC does not routinely check the incidental astrometry (IA) of the big surveys for such linkages promptly enough for targeted followup. Spacewatch has developed an effective brute force exploratory linking technique working on three or more visits during a single lunation. The astrometric data, subject only to a comparison of net motion with that of the main belt, are exhaustively tested in all combinations which search for consistent circular, Väisälä, or Gaussian orbits with non-systematic residuals. A postprocessing step combines multiple realizations of the same orbit from the repeated visits.

Larsen refined this code over the past year and in May 2005 deployed it on a brand new 64 node Scyld Beowulf cluster at the US Naval Academy where it is now available to run in real time on incoming data. The code was also retroactively applied to the 2004 September - 2005 May observing season in which we tried to revisit the same "cohorts" of distant asteroids three times per lunation by walking the observed centers along at the average rate of main belt asteroids between visits. Initial results are promising, with 8500 linkages of main belt objects plus numerous candidates for EAs. We estimate we will have three times the opportunities to recognize EAs than we had prior to linking. The opportunity may be higher than this because the distant EAs are closer to the ecliptic plane, requiring less sky coverage to observe per EA.

Assuming our current survey method, a pessimistic limiting magnitude, no improvement in survey speed, typical weather, and a synthetic population of plausibly undiscovered EAs, we predict that linking could yield an additional  $7\sqrt{2}$  EAs with  $H < 20$  and  $3\sqrt{2}$  EAs with  $H \# 18$  per year. These discoveries would be in addition to our current rate of detections and discoveries of EAs.

### **Data Archiving and Reprocessing:**

With support from a grant from NASA/AISRP to Larsen, all 1.5 terabytes of data previously stored on magnetic tape between 1990 and 1999 were copied to DVD-RAM media. This stabilized the data and simplified reprocessing. The data covered 75,000 square degrees to a limiting V magnitude of  $\sim 21.5$ . All of those data were reprocessed with Larsen's newest generation of asteroid detection software to yield 190,830 detections of moving objects that were undetected by the pre-Larsen software, making a total of 423,220 detections of asteroids by Spacewatch from 1990 to 1999 inclusive. (One Adetection@ usually equals three positions.) Thus the reprocessing yielded a 82% percent improvement on Spacewatch's effort over almost 9 years, equivalent to 7 additional years of Spacewatch operations at the level of performance at that time.

The newly derived positions were submitted to the MPC. One immediate result was that the virtual impactor 1994 UG was retired from the JPL impact risk page. The MPC has linked 55,852 of our new archival detections with known asteroids and will continue to try to identify our detections and use them to extend the arcs of asteroids. Among the positions derived from the reprocessing, we reported 597 previously undetected asteroids with high probabilities of being EAs. The MPC has so far linked 237 of those objects with known asteroids and 66 of them have been identified with known EAs. Out of those 66 EAs, 21 are PHAs. The remaining 360 EA candidates in our reprocessing output that are as yet unlinked with known objects cannot be recovered at the telescope solely on the basis of such old data. However, our data will provide immediate information (precoveries) to the arcs of new discoveries that are identified with our earlier observations.

### **Statistics of Earth Approachers:**

We promised that the statistical properties of [EA detections] will be presented as constraints on the numbers of EAs with  $H \leq 22$ , their distribution with absolute magnitude, the number of PHAs, and on the evolution of EA orbits. A study has been made by our collaborator and former Spacewatch staff member Jeffrey A. Larsen, now an Assistant Professor in the Department of Physics of the U. S. Naval Academy in Annapolis, MD. Larsen has used knowledge of Spacewatch sky area coverage and EA detections to extrapolate to the total number of EAs with  $H \leq 22$  detectable by Spacewatch all over the sky. At any instant of time, there should be approximately  $360^\circ/40^\circ$  EAs with  $H \leq 22$  within reach of Spacewatch. This corresponds to about 1 object per 115 square degrees, or an average angular separation of 11 degrees between objects. To detect the thousands of such objects, observations would have to be continued for decades because only a small fraction of the NEOs are within reach at any given time. However, it is possible to estimate the size of the population by using knowledge of their orbital distribution. Figure 5, following a similar plot by Harris and Bowell (2005), compares the distribution of EAs versus absolute magnitude determined by Larsen from Spacewatch data with previous studies. The agreement with all but one study is good. Larsen also found that the work by Rabinowitz (1993) contained a conceptual error that explains its departure from the other studies.

#### **Other Research:**

*Asteroid Detection:* Gural, Larsen and Gleason (2005) developed a matched filter processing algorithm that shifts and stacks images at the rate of motion of an asteroid being sought. While execution time and false candidates make the software impractical to use in survey mode, the algorithm works better than our survey software when presented with only a small number of hypothesized motions, as for a recovery. In that case, the observer is presented with review candidates which match only the specified target motion.

*NEO Families:* Scotti collaborated with Fu, Jedicke, Durda and Fevig on a study of the identification of Near Earth object families using the D-criterion (Fu et al., 2005). Drummond (1991, 2000) concluded that at least one Near-Earth Object (NEO) family existed using the D-criterion to analyze the similarity of asteroid orbits. Fu et al. found that the Drummond families were unlikely to be anything more than random fluctuations in the distribution of NEO osculating orbital elements. This conclusion was a result of simulations of randomly generated synthetic populations that contained no genetically related NEOs as well as dynamical studies of the decoherence timescales of synthetic NEO families resulting from collisions between an NEO and a main belt asteroid. A new criterion was found that can be used to select real NEO families in future analyses of the NEO population as the number of discovered NEOs continues to rise.

#### **Automation of a Spacewatch Telescope:**

In 2002, NASA provided funds to automate one of the two Spacewatch telescopes. In April and May 2005 the 0.9-meter telescope was operated for the first time with computer control of dome

rotation. This large, old electromechanical system was the final and most difficult component to be put under automatic control. It is now possible to let the automatic scheduler run the telescope, CCD, and dome in survey mode all night after initial setup by the observer. However, the observer at that telescope still has to review all the images of candidates for asteroids, designate and mail interesting objects to the MPC, organize followup observations by the 1.8-meter telescope, and deal with weather and contingencies with the equipment. In November 2005 we installed an electromechanical hardware unit independent of the computer to prevent any software bugs or servo malfunctions from driving the dome superstructure into the telescope.

With that safety system, it became possible for the 0.9-meter telescope to run unattended while the remaining duties of the observer at the 0.9-meter telescope are taken by the observer at the 1.8-meter. This mode of operation was first used in December 2005. As observers become trained in this new mode, observer duty will reduce to one person at a time. However, managing the data from two telescopes may require assistance from a second person reviewing images in Tucson in the daytime after each night of observing.

## COLLABORATIONS

**Asteroid Astrometry in Mongolia:** Mongolian observers (q.v. our earlier reports) are doing astrometry of asteroids with equipment purchased with funds from AFOSR. Their limiting V magnitude is about 18, typical for that detector and aperture of telescope. Their photometric accuracy is also reasonable for that equipment. The effect of low ambient temperatures in the winter on the declination bearings of the telescope was still a problem during the winter of 2003-4. They visited Tucson in January 2004 with funds from a grant from AOARD/Tokyo, during which time we provided additional training and advice for them. We also provided them with a new larger CCD imaging detector, a new computer, and other needed accessories. Later they suffered the loss of their electronics that controls the declination drive of their telescope during an electrical storm. They mailed the affected circuit board to us for repair and/or replacement. We will not charge them for that.

### **Asteroid Astrometry in Northwest Australia:**

We collaborated with astronomer John A. Kennewell at the Learmonth Solar Observatory near Exmouth in Northwestern Australia, who plans to do followup astrometry of bright EAs and measure lightcurves of selected asteroids. The addition of this new astrometric station in the southern hemisphere will help refine the orbital parameters of asteroids that move south after discovery. This telescope will also survey the southern hemisphere sky for EAs and other asteroids. The site has a dry climate and clear skies for 80% of the year. The telescope will provide a monitor of EAs in the southern sky to better than magnitude 18. Rotational photometry at the Learmonth site will investigate spin rates and principal axes of EAs. These are physical characteristics that are vital for the applied mitigation phase of planetary defense.

A complete 14-inch (0.36-meter) telescope system, CCD imaging detector, and software, purchased with funds from a previous year of AFOSR funding, are in Dr. Kennewell's



observatory dome. Kennewell expects to operate at least five nights per lunation. Initially at least, 70% of the observations will be devoted to follow-up positional determination, 30% to searching regions of the sky not readily accessible to northern telescopes, with the possibility of a small amount of time devoted to light curve determinations (asteroid rotation analysis). Kennewell came to Tucson in January 2004 to help train the Mongolian astronomers with the new equipment we provided them.

Recently Dr. Kennewell responded favorably to my suggestion to observe the lightcurve of the bright EA 1992 UY4 that is currently well-placed for observing in the southern hemisphere. This object is of high priority because the Goldstone and Aricebo radar stations plan to observe it August 1-10. A lightcurve determined by ground-based telescopes can provide knowledge of the object's rotation rate, which is important in both planning and interpreting the returning radar signals. In particular, the ground-based data help to estimate the three dimensional shape from delay-Doppler radar images.

### **Relationship of Spacewatch to the WISE spacecraft mission:**

E. L. Wright of the UCLA Astronomy Dept. is the PI of the Wide-field Infrared Survey Explorer (WISE) MIDEX spacecraft mission. WISE will map the whole sky at thermal infrared wavelengths with 500 times more sensitivity than the IRAS mission 20 years ago and will detect a few hundred EAs with diameters  $> 600$  m, as well as tens of thousands of asteroids in the main belt. The WISE team selected Spacewatch in 2001 as their ground-based collaborator because the EAs that WISE expects to discover will run as faint as  $V \sim 21$ . Because WISE will observe along a great circle 90E from the Sun, some of the EAs it detects may be ones that would have eluded ground-based surveys. This elongation also happens to be where Earth impactors tend to dwell the longest (Chesley and Spahr 2004). Spacewatch would do ground-based astrometric and photometric recovery and followup of EAs detected by WISE. Spacewatch has demonstrated the capabilities to both survey as well as followup at small elongations.

WISE's detections in the thermal infrared will also provide a size-limited sample of asteroids instead of the brightness-limited surveys being done at visible wavelengths. This advantage results from the dependence of infrared flux on  $(1 - \text{albedo})$  instead of the visual magnitude's dependence on albedo. The range of albedo values for EAs is 0.05 - 0.5 (Morbidelli et al. 2002), a factor of 10, while the corresponding range for  $(1 - \text{albedo})$  is only a factor of 2. Therefore diameters derived from IR flux are more certain than those estimated from visual absolute magnitude in the absence of albedo information. WISE will provide the first qualitatively new determination of the size distribution since the analyses of detections by ground-based surveys were published some years ago. Knowing the size distribution of EAs is essential to establish when the Spaceguard goal of finding 90% of all EAs larger than 1 km has been achieved. Specifically, it will reveal how much the optically-determined size distribution we've been using for asteroids has been biased against low albedo objects. This is relevant to the conversion between absolute mag  $H$  and diameter  $D$  and thus the corresponding estimate of the number of

EAs with H#18 vs. the number of EAs with D $\geq$ 1 km. Spacewatch has extensive experience with the analysis and publication of such studies.

In August 2004, WISE was authorized to proceed into Phase B, with a Preliminary Design Review (PDR) in June 2005. Launch is currently scheduled for June 2009. In a possible Phase F of an enhanced and extended WISE mission, data from WISE would be processed more rapidly to allow detection of moving objects in time for followup. McMillan continues to advise the WISE team on asteroid detection, especially to propose Phase F to NASA.

A possible Education/Public Outreach (E/PO) activity related to the WISE mission would be for students to do visual reviews of images of candidates for moving objects detected by WISE, using the methods & experience of the Spacewatch FMO Project that is staffed by on-line volunteers (McMillan, Block, & Descour 2005).

**Assistance to Pan-STARRS:** The next few years will see the beginning of the operation of the Air-Force-funded Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) of the University of Hawaii's Institute for Astronomy. The PI of Pan-STARRS is Nick Kaiser, and former Spacewatch team member Robert Jedicke is now the Manager of the moving object processing system of Pan-STARRS. The Pan-STARRS group will begin discovering asteroids in 2006 with their first prototype telescope, PS1. PS1 will detect asteroids down to about R $\sim$ 23, and should find an order of magnitude more PHAs per lunation than all other current surveys combined (Jedicke 2005, personal communication). (The final Pan-STARRS configuration is expected to find asteroids yet another order of magnitude faster than the prototype.)

Pan-STARRS' revisits of areas surveyed during a lunation will allow the Pan-STARRS group to determine preliminary orbits of asteroids spanning 4-8 days. However, additional followup observations with other telescopes would help Pan-STARRS make linkages in their archives. The Spacewatch 1.8-meter telescope can reach V=23.3, the faintest limit available from a dedicated asteroid followup telescope. Spacewatch personnel are also eligible to apply for time on larger telescopes of the University of Arizona. Spacewatch has also agreed to collaborate with Pan-STARRS by providing Pan-STARRS with samples of Incidental Astrometry (IA) and the corresponding pointing history on which they could test their new software. The samples would have to be from several lunations and include revisits of regions, as Spacewatch has been doing since 2004 September. A copy of the agreement between Pan-STARRS and Spacewatch is provided here:

>From kaiser@ifa.hawaii.edu Mon May 30 13:07:24 2005  
To: bob@lpl.arizona.edu  
Cc: Nick Kaiser <kaiser@ifa.hawaii.edu>, jedicke@ifa.hawaii.edu  
Subject: Pan-STARRS/Spacewatch cooperation?

Dear Bob,

This is a follow-up to discussions I understand you have had with our moving objects specialist Rob Jedicke. As you know, the Pan-STARRS Moving Object Processing

System (MOPS) is being designed and tested to operate at asteroid detection rates almost 100X higher than existing surveys. First light on the prototype system, PS-1, on Haleakala is expected to be early in 2006 with actual asteroid observations available late in that year. We believe that Spacewatch and Pan-STARRS can operate synergistically in the next few years in two ways.

First, the MOPS team is working diligently on testing their pipeline using synthetically generated data, but want to ensure that the system is capable of handling data from other surveys and operating on realistic data with all their idiosyncracies. The wide-area and depth of Spacewatch coverage with your mosaic camera makes it the best system in the world for testing the MOPS. We would like to arrange access to your astrometry for that purpose. If possible, we would like access to all the astrometry for any possible detections identified by your system rather than only the incidental astrometry reported to the MPC. The MOPS must operate under the presence of false detections.

Secondly, your 1.8m system is the only dedicated asteroid surveying system that can consistently and regularly reach the  $R=23$  limit expected for PS-1. While PS-1 should obtain three nights of observation for many asteroids in any lunation, there will be many more occasions when only two nights of observations are available, or when a PHO of considerable interest requires follow-up observations that are difficult to obtain with PS-1. PS-1 is designed as a survey system, not for follow-up. Thus, we see that cooperation between Pan-STARRS and Spacewatch could provide your team multiple targets each month for follow-up that will extend the observational arc of Pan-STARRS detections and allow more precise orbit determination and impact calculations.

Please let me know whether Spacewatch is interested in either of these forms of collaboration with Pan-STARRS.

Sincerely,

Dr. Nick Kaiser, PI  
cell: 808-520-3680  
Pan-STARRS  
Institute for Astronomy  
2680 Woodlawn Dr.  
Honolulu, HI, 96822

## REFERENCES

- Brown, P. R.E., D. O. Spalding, E. ReVelle, E. Tagliaferri, S.P. Worden. 2002. The flux of small Near-Earth objects colliding with the Earth. *Nature*, **420**, 294-296.
- Chesley, S. R., and T. B. Spahr. 2004. Earth impactors: Orbital characteristics and warning times. In *Mitigation of Hazardous Asteroids and Comets*, Eds. M. Belton et al., Cambridge Press, 22-37.
- Drummond, J. D. 1991. Earth-approaching asteroid streams. *Icarus* **89**, 14-25.
- Drummond, J. D. 2000. The D Discriminant and Near-Earth asteroid streams. *Icarus* **146**, 453-475.
- Fu, H., R. Jedicke, D. D. Durda, R. Fevig, and J. V. Scotti. 2005. Identifying near Earth object families. *Icarus* **178**, 434-449.
- Gehrels, T. 1991. Scanning with charge-coupled devices. *Space Science Reviews* **58**, 347-375.
- Gehrels, T., B. G. Marsden, R. S. McMillan, and J. V. Scotti 1986. Astrometry with a scanning CCD. *Astron. J.* **91**, 1242-1243.
- Gural, P. S., J. A. Larsen, and A. E. Gleason 2005. Matched filter processing asteroid detection. *Astron. J.*, **130**, 1951-1960.
- Harris, A. W., and E. Bowell. 2005. NEO observations with LSST: Populations and survey completeness. <http://pan-starrs.ifa.hawaii.edu/project/people/harris/AAS.ppt> .
- Jedicke, R. 1996. Detection of near Earth asteroids based upon their rates of motion. *Astron. J.* **111**, 970-982.
- McMillan, R. S. 1999a. The Spacewatch search for material resources near Earth. In *Space Manufacturing 12: Challenges and Opportunities in Space: Proceedings of the Fourteenth Space Studies Institute's Princeton Conference on Space Manufacturing, May 6-9, 1999*, B. Greber, Ed. (SSI Publishing, Princeton, NJ), 72-75.
- McMillan, R. S. 1999b. Spacewatch discovery and study of accessible asteroids. Abstract of paper presented at the *First Space Resources Roundtable at the Colorado School of Mines in Golden, CO*: Lunar & Planetary Institute (Houston) Contrib. No. 988 and <http://www.mines.edu/research/srr> .
- McMillan, R. S., M. Block, and A. S. Descour. 2005. The Spacewatch volunteer search for fast-moving objects. *Minor Planet Bulletin*, **32**, No. 3, page 53, URL: <http://www.minorplanetobserver.com/mpb/MPB%2032-3.pdf> .
- McMillan, R. S., T. Gehrels, J. V. Scotti and J. E. Frecker 1986. Use of a scanning CCD to discriminate asteroid images moving against a background of stars. In *Instrumentation in Astronomy: Proc. S.P.I.E. 627* (D. L. Crawford, Ed.), **VI**, 141-154.
- McMillan, R. S., M. L. Perry, T. H. Bressi, J. L. Montani, A. F. Tubbiolo, M. T. Read. 2000. Progress on the Spacewatch 1.8-m telescope and upgrade of the Spacewatch 0.9-m telescope. *B. A. A. S.* **32**, 1042-1043.
- McMillan, R. S., and C. P. Stoll 1982. Software simulations of the detection of rapidly moving asteroids by a charge-coupled device. *Proc. SPIE 331, Instrumentation in Astronomy IV*, 104-112.
- Morbidelli, A., R. Jedicke, W. F. Bottke, P. Michel, and E. F. Tedesco 2002. From magnitudes

- to diameters: The albedo distribution of near Earth objects and the Earth collision hazard. *Icarus*, **158**, 329-342.
- Perry, M. L., T. H. Bressi, R. S. McMillan, A. F. Tubbiolo, and L. D. Barr 1998. The 1.8m Spacewatch telescope motion control system. *Proc. SPIE 3351, Telescope Control Systems III*, 450-465.
- Rabinowitz, D. L. 1991. Detection of Earth-approaching asteroids in near real time. *Astron. J.* **101**, 1518-1529.
- Rabinowitz, D.L., 1993. The size distribution of the earth-approaching asteroids. *Astrophys. J.*, **407**, 412-427.
- Rabinowitz, D., Helin, E., Lawrence, K., Pravdo, S. 2000. A reduced estimate of the number of kilometre-sized near-Earth asteroids. *Nature*, **403**, 165-166.
- Scotti, J. V. 1994. Computer aided near Earth object detection. in *Asteroids, Comets, and Meteors 1993*, A. Milani et al., eds., Kluwer, 17-30.
- Stokes, G., et al. 2000. Lincoln Near-Earth Asteroid Research program (LINEAR). *Icarus*, **148**, 21-28.
- Stuart, J.S. and Binzel, R.P. 2004. Bias-corrected population, size distribution, and impact hazard for the near-Earth objects. *Icarus*, **170**, 295-311.

## FIGURE CAPTIONS

**Figure 1.** Cumulative count of Spacewatch detections of H#22 PHAs (triangles) and H#18 EAs (squares) vs. time. A Spacewatch Adetection@ consists of three positions, and only one detection per object per night is counted on this plot.

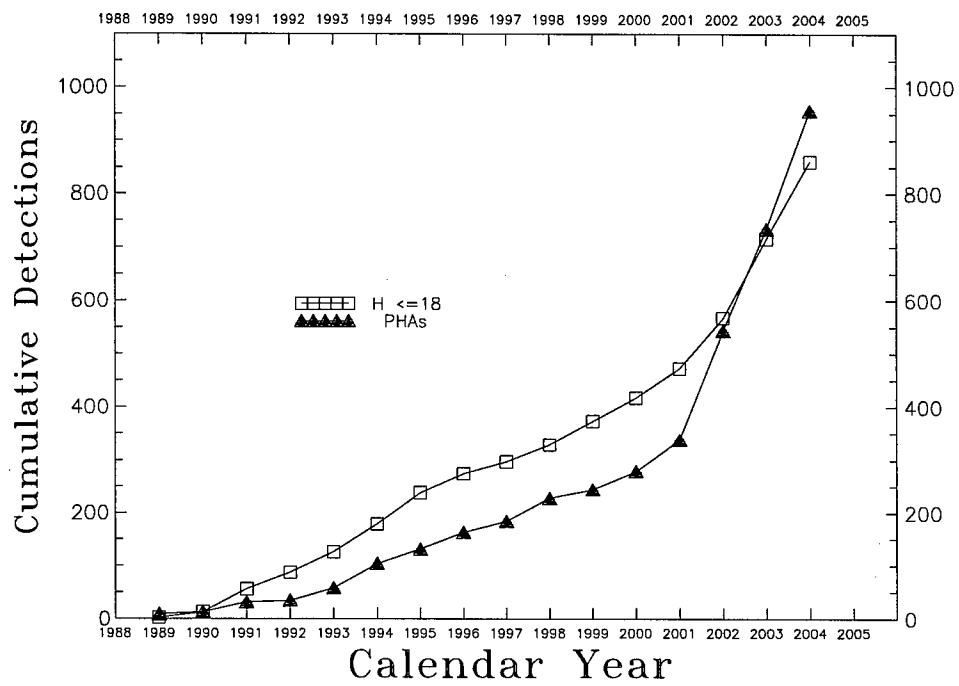
**Figure 2.** Numbers of distinct PHAs with H#18 observed while faint in the last 3 years, by station.

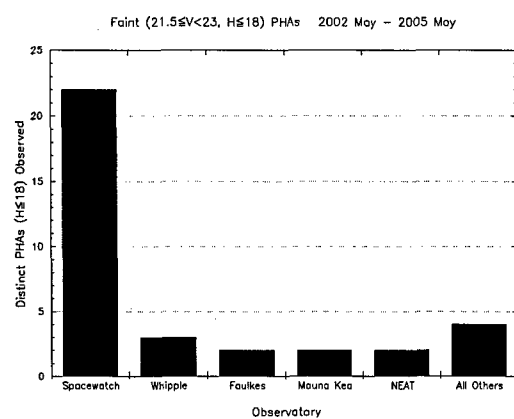
**Figure 3.** Numbers of distinct PHAs with H#22 observed while faint in the last 3 years, by station.

**Figure 4(a), (b), (c).** Regions observed with the Spacewatch mosaic of CCDs, 2003 Mar. - 2005 May. The ecliptic and Milky Way are also shown.

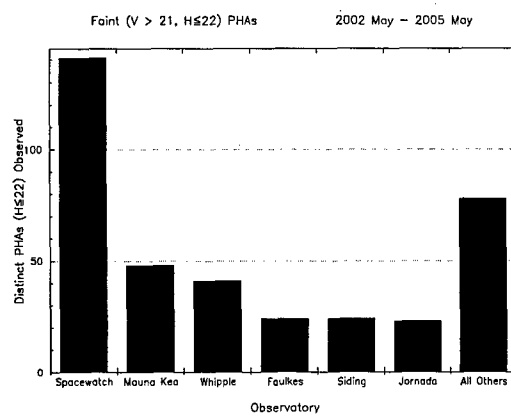
**Figure 5.** Cumulative distribution of NEOs vs. absolute magnitude corrected for observational bias and selection effects. The results of the survey with the Spacewatch mosaic are compared with previous work, according to the symbols. The approximate impact intervals and diameters are shown on the right hand and top scales, respectively.

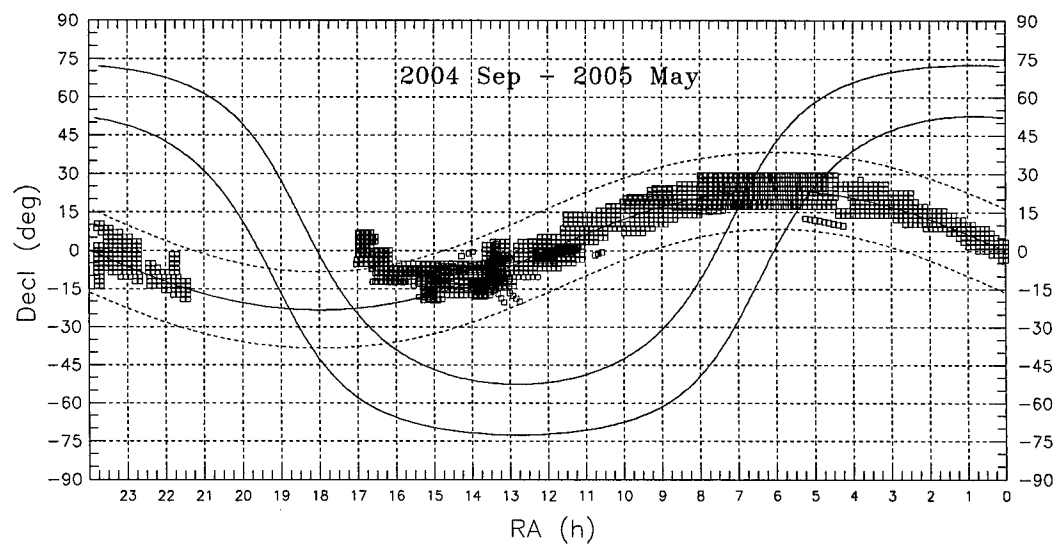
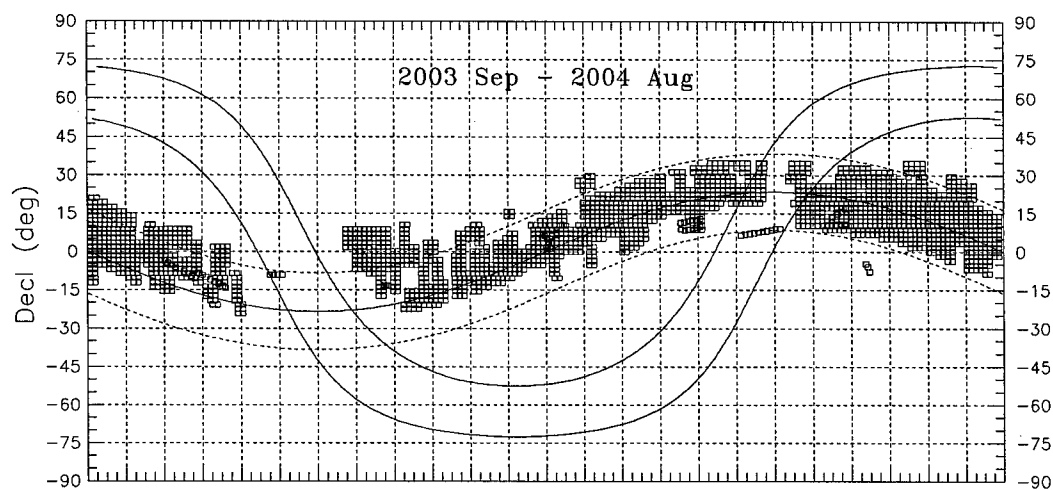
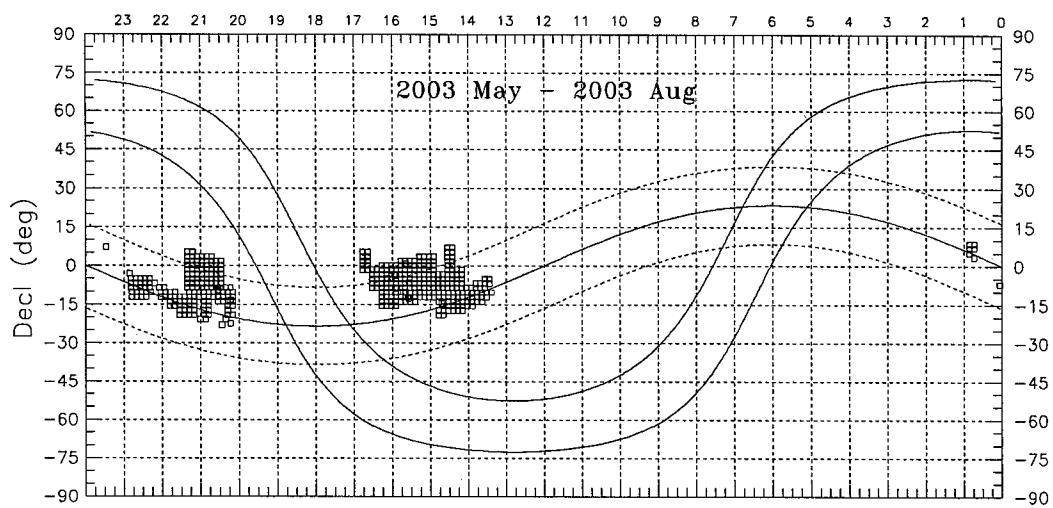
# NEO Detections by Spacewatch Telescopes

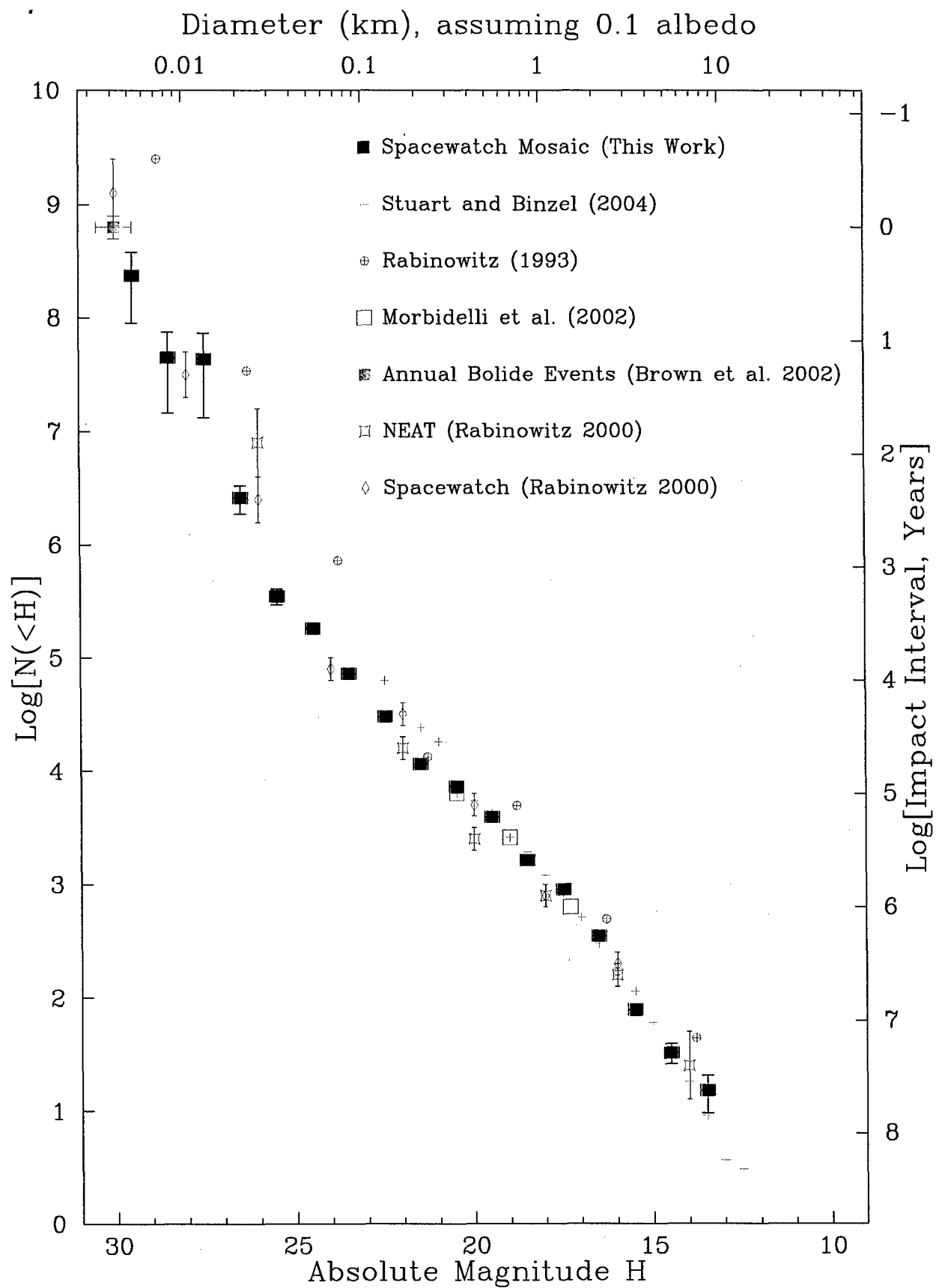














## SPACEWATCH PUBLICATIONS

**Journal Articles, Papers, and Abstracts, 1 Dec 2002 - 30 Nov 2005:** (Spacewatch authors are in bold face.)

- Cabanela, J. E., R. M. Humphreys, G. Aldering, **J. A. Larsen**, S. C. Odewahn, P. M. Thurmes, and C. S. Cornuelle. 2003. The automated plate scanner catalog of the Palomar Sky Survey. II. The archived database. *Pub. Astronomical Society of the Pacific*, **115**, 837-843.
- Fu, H., R. Jedicke, D. D. Durda, R. Fevig, and **J. V. Scotti**. 2005. Identifying near Earth object families. *Icarus*, **178**, 434-449.
- Gural, P. S., J. A. Larsen, and A. E. Gleason. 2005. Matched filter processing asteroid detection. *Astron. J.*, **130**, 1951-1960.
- Jedicke, R., J. Larsen, and T. Spahr. 2003. Observational selection effects in asteroid surveys and estimates of asteroid population sizes. In *Asteroids III* (W. Bottke et al., eds.). University of Arizona, Tucson, 71-87.
- Jedicke, R., A. Morbidelli, T. Spahr, J-M. Petit, W. F. Bottke Jr. 2003. Earth and space-based NEO survey simulations: Prospects for achieving the Spaceguard goal. *Icarus*, **161**, 17-33.
- Larsen, J. A., R. M. Humphreys. 2003. Fitting a galactic model to an all-sky survey. *The Astron. J.*, **125**, 1958-1979.
- McMillan, R. S., M. Block, and A. S. Descour. 2005. The Spacewatch volunteer search for fast-moving objects. *Minor Planet Bulletin*, **32**, No. 3, page 53, URL: <http://www.minorplanetobserver.com/mpb/MPB%2032-3.pdf>.

**IAU Circulars:** (Spacewatch authors are in bold face. Other authors not always listed here. IAU Circulars may be viewed at <http://cfa-www.harvard.edu/iauc/RecentIAUCs.html#form>.)

**Block, M., T. H. Bressi, and J. V. Scotti.** 2005. Observations of Periodic Comet P/2005 GF8. In IAU Circ. 8510.

**Block, M.** 2005. Prediscovery Observations of Comet C/2005 S2 (Skiff). IAU Circ. 8606.

**Bressi, T. H., R. S. McMillan, and A. F. Tubbiolo.** 2005. Prediscovery Observations of Periodic Comet P/2005 L4 (Christensen). In IAU Circ. 8543.

**Descour, A. S.** 2004. Prediscovery Observations of Period Comet P/2004 A1. In IAU Circ. 8267.

**Gleason, A. E.** 2003. Imagery of Periodic Comet P/2001 RG100. In IAU Circ. 8244.

**Gleason, A. E., T. Gehrels, et al.** 2003. Discovery and followup of Comet C/2003 A2. In IAU Circ. 8049.

**Gleason, A. E., J. A. Larsen, and J. V. Scotti.** 2004. Observation of Cometary Features in Periodic Comet P/2004 HC18. In IAU Circ. 8333.

**Larsen, J. A.** 2004. Discovery of Comet C/2004 C1 (Larsen). In IAU Circ. 8286.

**Larsen, J. A.** 2004. Discovery of Periodic Comet P/2004 H2 (Larsen). In IAU Circ. 8328.

**Larsen, J. A.** 2004. Discovery of Periodic Comet P/2004 H3 (Larsen). In IAU Circ. 8332.

**Larsen, J. A., Gleason, A. E.** 2003. Discovery of comet C/2003 K1 (Spacewatch). In IAU Circ. 8135.

**McMillan, R. S.** 2003. Incidental Observations of Periodic Comet P/2003 UY275 (LINEAR). In IAU Circ. 8247.

**Read, M. T.** 2005. Discovery Observations of Periodic Comet P/2005 T3 (Read). In IAU Circ. 8614.

**Read, M. T., T. H. Bressi, T. Gehrels, and J. V. Scotti.** 2005. Discovery and Followup Observations of Comet P/2005 U1 (Read). In IAU Circ. 8624.

**Read, M. T., and J. A. Larsen.** 2004. Independent Discovery of Comet P/2004 EW38 (Catalina-LINEAR). In IAU Circ. 8322.

**Read, M. T., and J. V. Scotti.** 2005. Discovery and Followup Observations of Comet C/2005 S3 (Read). In IAU Circ. 8608.

**Scotti, J. V.** 2003. Discovery of comet C/2003 L1 (Scotti). In IAU Circ. 8145.

**Tubbiolo, A. F.** 2005. Discovery and Followup Observations of Comet C/2005 E1. In IAU Circ. 8491.

**Minor Planet Electronic Circulars (MPECs):**

(MPECs can be viewed at <http://cfa-www.harvard.edu/mpec/RecentMPECs.html#form.>)

**MPECs, 2002 Dec 1 -31:**

Block, M., and J. V. Scotti. 2002. Recovery of Potentially Hazardous Asteroid 2001 PM<sub>9</sub>. In MPEC 2002-X50.

McMillan, R. S., and M. Block. 2002. Discovery and followup of Apollo asteroid 2002 XC<sub>91</sub>. In MPEC 2002-Y69.

Scotti, J. V. 2002. Followup astrometry of Amor Asteroid 2001 KN<sub>20</sub>. In MPEC 2002-Y72.

**MPECs, 2003:**

Block, M. 2003. Discovery and follow-up of Amor Asteroid 2003 BN<sub>4</sub>. In MPEC 2003-B35.

Block, M. 2003. Followup Observations of Asteroids 2003 FT<sub>3</sub>, 2003 HN, and 2003 HB<sub>6</sub>. In MPEC 2003-H43.

Block, M. 2003. Astrometric observations of Potentially Hazardous Asteroids 2003 CR<sub>20</sub> and 2003 EF<sub>54</sub>. In MPEC 2003-P27.

Block, M. 2003. Follow-up of Apollo PHA 2003 MH<sub>4</sub>. In MPEC 2003-S01.

Block, M. 2003. Discovery of small, nearby Apollo Asteroid 2003 SY<sub>4</sub>. In MPEC 2003-S12.

Block, M. 2003. Follow-up observations of fast-moving radar target Aten Asteroid 2003 RU<sub>11</sub>. In MPEC 2003-S13.

Block, M. 2003. Incidental follow-up observations of Asteroid 2003 SA<sub>85</sub>. In MPEC 2003-T24.

Block, M. 2003. Follow-up observations of Periodic Comet 2P. In MPEC 2003-T48.

Block, M. 2003. Follow-up observations of small Apollo Asteroid 2003 UO<sub>25</sub>. In MPEC 2003-U68.

Block, M. 2003. Discovery and follow-up of small Apollo Asteroid 2003 UR<sub>25</sub>. In MPEC 2003-U71.

Block, M. 2003. Follow-up observations of Asteroids 2001 SH<sub>276</sub>, 2003 TH<sub>2</sub>, 2003 UO<sub>12</sub>, and 2003 UO<sub>25</sub>. In MPEC 2003-U72.

Block, M. 2003. Followup Observations of Asteroids 2003 MT and 2003 WG. In MPEC 2003-W45.

Block, M. 2003. Recovery of Apollo Asteroid 2001 SF<sub>286</sub>. In MPEC 2003-W46.

Block, M. 2003. Followup Observations of Asteroids 2003 WO<sub>151</sub> and 2003 WH<sub>166</sub>. In MPEC 2003-X56.

Block, M. 2003. Recovery of Amor Asteroid 2001 OG<sub>25</sub>. In MPEC 2003-Y66.

Block, M. 2003. Followup Observations of Asteroid 2003 YO<sub>1</sub>. In MPEC 2003-Y67.

Block, M. 2003. Recovery of Potentially Hazardous Asteroid 2001 VK<sub>5</sub>. In MPEC 2003-Y71.

Block, M. 2003. Followup Observations of Asteroids 2003 NW<sub>1</sub> and 2003 YW<sub>1</sub>. In MPEC 2003-Y75.

Block, M., A. S. Descour, A. E. Gleason, and J. V. Scotti. 2003. Follow-up observations of Asteroids 1995 SA, 1996 SK, 2003 AY<sub>2</sub>, (2201), and (31221). In MPEC 2003-R29.

Block, M., A. E. Gleason. 2003. Discovery and follow-up of distant, large Apollo Asteroid 2003 SY<sub>17</sub>. In MPEC 2003-S25.

Block, M., J. A. Larsen. 2003. Discovery and follow-up observations of small Amor Asteroid 2003 TK<sub>1</sub>. In MPEC 2003-T25.

Block, M., J. A. Larsen. 2003. Discovery and follow-up observations of small Apollo Asteroid 2003 TH<sub>2</sub>. In MPEC 2003-T34.

Block, M., J. A. Larsen, A. F. Tubbiolo. 2003. Discovery and follow-up astrometry of Hungaria Asteroid 2003 KK<sub>20</sub>. In MPEC 2003-L11.

Block, M., and J. A. Larsen. 2003. Followup Astrometry of Asteroids 1999 HE<sub>1</sub>, 1999 JU<sub>3</sub>, 2003 OR<sub>14</sub>, 2003 UN<sub>12</sub>, 2003 UW<sub>29</sub>, 2003 UX<sub>34</sub>, and (4450). In MPEC 2003-W28.

Block, M., Larsen, J. A., and Scotti, J. V. 2003. Followup Observations of Asteroids 2001 AE<sub>2</sub>, 2001 XE<sub>1</sub>, 2002 AC<sub>2</sub>, 2002 KH<sub>4</sub>, 2003 KR<sub>18</sub>, 2003 TR<sub>9</sub>, 2003 WG, 2003 WO<sub>7</sub>, 2003 WP<sub>7</sub>, 2003 WP<sub>25</sub>, and (34613). In MPEC 2003-W42.

Block, M., and J. A. Larsen. 2003. Followup Observations of Highly Eccentric Outer Solar System Object 2003 WT<sub>42</sub>. In MPEC 2003-W48.

Block, M., J. A. Larsen, and J. V. Scotti. 2003. Followup Observations of Asteroids 1993 VD, 2003 HP<sub>32</sub>, 2003 NW<sub>1</sub>, 2003 WU<sub>21</sub>, and (30825). In MPEC 2003-W49.

Block, M., and J. A. Larsen. 2003. Recovery of Apollo Asteroid 2001 XF<sub>1</sub>. In MPEC 2003-W71.

Block, M., R. S. McMillan. 2003. Prediscovery observations of Amor Asteroid 2003 HB<sub>6</sub>. In MPEC 2003-H36.

Block, M., J. V. Scotti. 2003. Recovery of faint, fast-moving radar target Asteroid 2002 AA<sub>29</sub>. In MPEC 2003-A17.

Block, M., J. V. Scotti. 2003. Precovery and follow-up of Mars-Crosser 2002 YK<sub>29</sub>. In MPEC 2003-A63.

Block, M., J. V. Scotti. 2003. Discovery and follow-up of Amor Asteroid 2003 BQ<sub>35</sub>. In MPEC 2003-B44.

Block, M., A. F. Tubbiolo. 2003. Follow-up observations of Potentially Hazardous Apollo Asteroid 2001 EB<sub>18</sub> and incidental observations of Apollo Asteroids (06063), (65690), and (66008). In MPEC 2003-S10.

Block, M., A. F. Tubbiolo. 2003. Follow-up observations of 2003 SY<sub>4</sub>, and incidental observations of Minor Planet (6491). In MPEC 2003-S22.

Descour, A. S. 2003. Follow-up observations of Asteroids 2003 GR, 2003 SJ<sub>84</sub>, 2003 SJ<sub>215</sub>, and 2003 SN<sub>215</sub>. In MPEC 2003-S87.

Descour, A. S. 2003. Discovery and follow-up of potentially hazardous Apollo Asteroid UX<sub>34</sub>. In MPEC 2003-U93.

Descour, A. S. 2003. Followup Observations of Asteroid 2002 FA<sub>5</sub>. In MPEC 2003-X29.

Descour, A. S. 2003. Followup Observations of Asteroids 2001 SN<sub>289</sub>, 2001 XT<sub>1</sub>, and 2003 SJ<sub>215</sub>. In MPEC 2003-Y17.

Descour, A. S. 2003. Recovery of Amor Asteroid 1998 VS. In MPEC 2003-Y18.

Descour, A. S. 2003. Recovery of Amor Asteroid 2001 WN<sub>1</sub>. In MPEC 2003-Y35.

Descour, A. S., and M. Block. 2003. Recovery of Amor Asteroid 2001 TA<sub>45</sub>. In MPEC 2003-Y70.

Descour, A. S., A. E. Gleason. 2003. Observations of Periodic Comet 53P. In MPEC 2003-K36.

Descour, A. S., A. E. Gleason, A. F. Tubbiolo, J. A. Larsen. 2003. Discovery and Followup Observations of Centaur 2003 WL<sub>7</sub>. In MPEC 2003-W19.

Descour, A. S., and A. E. Gleason. 2003. Recovery of Large Amor Asteroid 2002 JS<sub>100</sub>. In MPEC 2003-Y95.

Descour, A. S., and R. S. McMillan. 2003. Followup Observations of Asteroids 2000 PD<sub>3</sub>, 2001 RY<sub>11</sub>, 2003 FJ<sub>1</sub>, 2003 SW<sub>222</sub>, and 2003 WW<sub>26</sub>. In MPEC 2003-X02.

Descour, A. S. and R. S. McMillan. 2003. Followup Observations of Asteroids 1999 HE<sub>1</sub>, 2000 WO<sub>107</sub>, 2003 TK<sub>2</sub>, 2003 UY<sub>19</sub>, and 2003 WO<sub>151</sub>. In MPEC 2003-X05.



- Descour, A. S., and R. S. McMillan. 2003. Observations of Periodic Comet P/2003 UY<sub>275</sub> (LINEAR). In MPEC 2003-X17.
- Descour, A. S., and R. S. McMillan. 2003. Followup Observations of Asteroids 2000 AF<sub>6</sub>, 2001 SG<sub>10</sub>, 2001 UY<sub>4</sub>, 2003 SN<sub>215</sub>, 2003 TO<sub>9</sub>, 2003 WP<sub>25</sub>, and (25916). In MPEC 2003-Y29.
- Descour, A. S., J. V. Scotti. 2003. Follow-up observations of Earth-Approaching Asteroids 2003 EG<sub>16</sub>, 2003 GA, 2003 SY<sub>17</sub>, 2003 SH<sub>84</sub>, and 2003 SM<sub>84</sub>. In MPEC 2003-S73.
- Descour, A. S., J. V. Scotti. 2003. Follow-up observations of Near Earth Objects 2003 SY<sub>17</sub>, 2003 SN<sub>214</sub>, and 2003 SG<sub>170</sub>. In MPEC 2003-S78.
- Descour, A. S., J. V. Scotti. 2003. Recovery observations of Apollo Asteroid 2001 JV<sub>2</sub>. In MPEC 2003-S93.
- Descour, A. S., J. V. Scotti. 2003. Recovery observations of Amor Asteroid 2002 AC<sub>2</sub>. In MPEC 2003-S94.
- Descour, A. S., and A. F. Tubbiolo. 2003. Followup Observations of Asteroids 2001 UY<sub>4</sub> and 2001 XE<sub>1</sub>. In MPEC 2003-W03.
- Gehrels, T. 2003. Observation of Comet 44P. In MPEC 2003-C08.
- Gehrels, T., R. S. McMillan. 2003. Discovery and follow-up of Potentially Hazardous Asteroid 2003 CC. In MPEC 2003-C20.
- Gehrels, T., R. S. McMillan. 2003. Follow-up observations of large, distant Apollo Asteroid 2003 SY<sub>17</sub> and incidental observations of Amor Asteroid 2003 QB<sub>31</sub>. In MPEC 2003-S49.
- Gehrels, T., and J. A. Larsen. 2003. Followup Observations of Asteroids 1999 JU<sub>3</sub>, 2000 UL<sub>11</sub>, 2003 QO<sub>104</sub>, 2003 MU, 2003 QF<sub>70</sub>, 2003 SV<sub>222</sub>, 2003 TK<sub>1</sub>, and (1580). In MPEC 2003-W20.
- Gleason, A. E. 2003. Discovery and follow-up of Potentially Hazardous Asteroid 2003 EE<sub>16</sub>. In MPEC 2003-E34.
- Gleason, A. E. 2003. Follow-up astrometry of Comet C/2003 A2 (Gleason). In MPEC 2003-E63.
- Gleason, A. E. 2003. Follow-up astrometry of Comet C/2003 A2 (Gleason). In MPEC 2003-E63.
- Gleason, A. E. 2003. Incidental observations of Minor Planets (8035) and (8037). In MPEC 2003-T13.
- Gleason, A. E. 2003. Follow-up Observations of Comet 129P. In MPEC 2003-T69.
- Gleason, A. E. 2003. Prediscovery observations of Amor Asteroid 2003 TX<sub>9</sub>. In MPEC 2003-U03.
- Gleason, A. E. 2003. Follow-up observations of Periodic Comet 22P. In MPEC 2003-U92.
- Gleason, A. E. 2003. Followup Observations of Asteroids 2002 PZ<sub>39</sub>, 2003 UB<sub>10</sub>, 2003 TK<sub>1</sub>, and 2003 UN<sub>12</sub>. In MPEC 2003-W17.
- Gleason, A. E. 2003. Followup Observations of Asteroids 2003 QB<sub>90</sub> and 2003 SV<sub>222</sub>. In MPEC 2003-W67.
- Gleason, A. E. 2003. Followup Observations of Asteroid 1998 FR<sub>11</sub>. In MPEC 2003-W70.
- Gleason, A. E. 2003. Followup Observations of Periodic Comet P/2001 RG<sub>100</sub>. In MPEC 2003-W74.
- Gleason, A. E. 2003. Followup of Asteroid 2003 WQ<sub>7</sub>. In MPEC 2003-X50.
- Gleason, A. E. 2003. Followup Observations of Periodic Comet P/2003 UY<sub>275</sub>. In MPEC 2003-Y11.
- Gleason, A. E. and M. Block. 2003. Discovery and follow-up observations of small Apollo Asteroid 2003 UQ<sub>25</sub>. In MPEC 2003-U70.

Gleason, A. E. and M. Block. 2003. Follow-up observations of Asteroids 2000 SO<sub>10</sub>, 2003 HR<sub>32</sub>, 2003 NW<sub>1</sub>, 2003 SN<sub>215</sub>, 2003 TK, 2003 TK<sub>1</sub>, 2003 TH<sub>2</sub>, 2003 UW<sub>5</sub>, and 2003 UB<sub>10</sub>. In MPEC 2003-U66.

Gleason, A. E. and M. Block, A. S. Descour, and R. S. McMillan. 2003. Follow-up observations of Asteroids 2001 SH<sub>276</sub>, 2002 KH<sub>4</sub>, 2003 SF<sub>170</sub>, and 2003 UV<sub>11</sub>. In MPEC 2003-U78.

Gleason, A. E., A. S. Descour\*. 2003. Recovery of Potentially Hazardous Apollo Asteroid 2000 UL<sub>11</sub>. In MPEC 2003-S71 . \*Name omitted by MPC by mistake.

Gleason, A. E., A. S. Descour\*. 2003. Recovery of Amor Asteroid 2002 AC<sub>3</sub>. In MPEC 2003-S72 . \*Name omitted by MPC by mistake.

Gleason, A. E., A. S. Descour, T. Gehrels, J. A. Larsen, R. S. McMillan. 2003. Discovery and Followup Observations of TNOs 2003 UY<sub>117</sub> and 2003 UZ<sub>117</sub> and Centaur 2003 UA<sub>118</sub>. In MPEC 2003-V06.

Gleason, A. E., and A. S. Descour. 2003. Discovery and Followup of Apollo Asteroid 2003 WE<sub>157</sub>. In MPEC 2003-X03.

Gleason, A. E., T. Gehrels. 2003. Discovery and follow-up observations of the small, closely-approaching Aten Asteroid 2003 SW<sub>130</sub>. In MPEC 2003-S48.

Gleason, A. E., T. Gehrels and A. F. Tubbiolo. 2003. Follow-up observations of Asteroids 1997 BQ, 2000 RH<sub>60</sub>, 2003 TH<sub>2</sub>, 2003 UO<sub>12</sub>, 2003 UQ<sub>25</sub>, 2003 UX<sub>34</sub>, and (5143). In MPEC 2003-U97.

Gleason, A. E., J. A. Larsen. 2003. Discovery and follow-up observations of Amor Asteroid 2003 TK. In MPEC 2003-T14.

Gleason, A. E., J. A. Larsen. 2003. Follow-up observations of Asteroids 2001 FB<sub>7</sub>, 2003 CN<sub>17</sub>, 2003 SC<sub>11</sub>, 2003 SJ<sub>84</sub>, 2003 SJ<sub>215</sub>, and 2003 SN<sub>215</sub>. In MPEC 2003-T18.

Gleason, A. E., J. A. Larsen. 2003. Follow-up observations of Asteroids 2001 CL<sub>42</sub>, 2003 TG<sub>2</sub>, 2003 SK<sub>36</sub>, and 2003 SV<sub>159</sub>. In MPEC 2003-U05.

Gleason, A. E., J. A. Larsen. 2003. Follow-up observations of Asteroids 1995 SA, 2003 MU, 2003 SJ<sub>215</sub>, 2003 SJ<sub>84</sub>, 2003 SN<sub>215</sub>, and (18736). In MPEC 2003-U09.

Gleason, A. E., J. A. Larsen. 2003. Follow-up observations of Asteroids 2000 RS<sub>11</sub>, 2002 KH<sub>4</sub>, and 2003 MU. In MPEC 2003-U17.

Gleason, A. E., J. A. Larsen, and R. S. McMillan. 2003. Discovery and Followup of Apollo Asteroid 2003 WO<sub>151</sub>. In MPEC 2003-W72.

Gleason, A. E., and R. S. McMillan. 2003. Followup Observations of Comets C/2001 HT<sub>50</sub> and P/2001 RG<sub>100</sub>. In MPEC 2003-X16.

Gleason, A. E., M. T. Read. 2003. Follow-up observations of Potentially Hazardous Apollo Asteroid 2003 FH, Amor Asteroid 2003 NB, large, distant Apollo Asteroid 2003 SY<sub>17</sub>, and Apollo Asteroid (66008). In MPEC 2003-S43.

Gleason, A. E., J. V. Scotti, M. Block. 2003. Discovery and Followup Observations of Outer Solar System Object 2003 UY<sub>283</sub>. In MPEC 2003-V58.

Gleason, A. E., and J. V. Scotti. 2003. Followup Observations of Asteroids 2003 WE<sub>157</sub>, 2003 WD<sub>158</sub>, 2003 WH<sub>166</sub>, 2003 YO<sub>1</sub>, 2003 YW<sub>1</sub>, (23714), and (38091). In MPEC 2003-Y94.

Gleason, A. E., A. F. Tubbiolo. 2003. Targeted follow-up observations of Earth-Approaching Asteroids 1998 UT<sub>18</sub>, 2003 CR<sub>20</sub>, 2003 DX<sub>10</sub>, 2003 EF<sub>54</sub>, 2003 SY<sub>4</sub>, 2003 SC<sub>11</sub>, and incidental observations of Minor Planet (5143). In MPEC 2003-S28.

Gleason, A. E., A. F. Tubbiolo. 2003. Follow-up observations of Amor Asteroid 2003 SC<sub>11</sub>, large, distant Apollo Asteroid 2003 SY<sub>17</sub>, and incidental observations of Apollo Asteroid 2000 SO<sub>10</sub>. In MPEC 2003-S32.

Gleason, A. E., and A. F. Tubbiolo. 2003. Followup Observations of Asteroids 2000 UL<sub>11</sub>, 2003 MU, and 2003 TK<sub>2</sub>. In MPEC 2003-W05.

Larsen, J. A. 2003. Recovery of Amor Asteroid 2000 FJ<sub>10</sub>. In MPEC 2003-F27.

Larsen, J. A. 2003. Observations of Periodic Comet P/2003 H4 (LINEAR). In MPEC 2003-K34.

Larsen, J. A. 2003. Observations of Periodic Comet P/2003 H4 (LINEAR). In MPEC 2003-L27.

Larsen, J. A. 2003. Recovery of Amor Asteroid 1999 TD<sub>5</sub> at small Solar Elongation. In MPEC 2003-T16.

Larsen, J. A. 2003. Discovery and follow-up observations of Potentially Hazardous Aten Asteroid 2003 TG<sub>2</sub>. In MPEC 2003-T35.

Larsen, J. A. 2003. Incidental follow-up observations of Periodic Comet P/2003 S1 (NEAT). In MPEC 2003-U34.

Larsen, J. A. 2003. Followup Observations of Comets C/2001 HT<sub>50</sub> and 119P. In MPEC 2003-W62.

Larsen, J. A. 2003. Followup Observations of Outer Solar System Object 2003 WN<sub>188</sub>. In MPEC 2003-Y43.

Larsen, J. A. 2003. Followup Observations of Asteroid 2000 WS<sub>67</sub>. In MPEC 2003-Y58.

Larsen, J. A., M. Block. 2003. Discovery and follow-up of highly eccentric Apollo Asteroid 2003 HP<sub>32</sub>. In MPEC 2003-H50.

Larsen, J. A., and M. Block. 2003. Discovery and Followup Observations of Aten Asteroid 2003 WP<sub>25</sub>. In MPEC 2003-W37.

Larsen, J. A., A. S. Descour, T. Gehrels, A. E. Gleason, R. Jedicke, J. L. Montani, D. L. Rabinowitz, J. V. Scotti. 2003. Prediscovery Observations of 41 Asteroids Yielded by Reprocessing Image Data Archives. In MPEC 2003-H27.

Larsen, J. A., Descour, A. S., T. Gehrels, A. E. Gleason, R. Jedicke, J. L. Montani, D. L. Rabinowitz, and J. V. Scotti. 2003. Prediscovery Observations of 18 Asteroids Yielded by Reprocessing Image Data Archives, and Observations of Two Additional Asteroids at the Current Epoch. In MPEC 2003-H35.

Larsen, J. A., A. S. Descour, D. L. Rabinowitz, J. V. Scotti, and A. E. Gleason. 2003. Prediscovery Observations of Five Numbered Asteroids Yielded by Reprocessing Image Data Archives, and Targeted Followup of Asteroids 2002 LY<sub>45</sub> and 2003 EN<sub>16</sub>. In MPEC 2003-H38.

Larsen, J. A., A. S. Descour, D. L. Rabinowitz, J. V. Scotti, T. Gehrels, and A. E. Gleason. 2003. Prediscovery Observations of 15 Asteroids Yielded by Reprocessing Image Data Archives, and Targeted Followup of Asteroid 2003 EN<sub>16</sub>. In MPEC 2003-H39.

Larsen, J. A., A. S. Descour, T. Gehrels, and M. Block. 2003. Prediscovery Observations of 3 Asteroids Yielded by Reprocessing Image Data Archives, and Targeted Followup of Asteroid 2003 HW<sub>10</sub>. In MPEC 2003-H42.

Larsen, J. A., A. S. Descour. 2003. Discovery and follow-up of Amor Asteroid 2003 JG<sub>4</sub>. In MPEC 2003-J21.

Larsen, J. A., and T. Gehrels. 2003. Discovery and Followup Observations of Small Apollo Asteroid 2003 WP<sub>7</sub>. In MPEC 2003-W23.

Larsen, J. A., T. Gehrels, and J. V. Scotti. 2003. Remeasurement of Images of Virtual Impactor Aten Asteroid 1994 WR<sub>12</sub>. In MPEC 2003-X52.

Larsen, J. A., A. E. Gleason. 2003. Discovery and follow-up of Comet C/2003 K1 (Spacewatch). In MPEC 2003-K37.

Larsen, J. A., A. E. Gleason. 2003. Preccovery astrometry of Amor Asteroid 2003 OB<sub>4</sub>. In MPEC 2003-O22.

Larsen, J. A., A. E. Gleason. 2003. Discovery and follow-up observations of tiny Apollo Asteroid 2003 UM<sub>3</sub>. In MPEC 2003-U12.

Larsen, J. A., A. E. Gleason, and M. Block. 2003. Discovery and Followup Observations of TNO 2003 WU<sub>172</sub>. In MPEC 2003-Y02.

Larsen, J. A., R. S. McMillan, and K. C. Cochran 2003. Followup Observations of Asteroids 2003 QB<sub>90</sub>, 2003 SH<sub>84</sub>, 2003 UN<sub>12</sub>, 2003 YO<sub>1</sub>, and 2003 UB<sub>10</sub>. In MPEC 2003-Y42.

Larsen, J. A., M. L. Perry, T. H. Bressi, A. F. Tubbiolo, M. T. Read, A. S. Descour, K. C. Cochran, J. L. Montani, R. S. McMillan, A. E. Gleason, J. V. Scotti. 2003. Discovery and follow-up of Amor Asteroid 2003 EN<sub>16</sub>; First NEO discovered with Spacewatch CCD Mosaic. In MPEC 2003-E38.

Larsen, J. A., J. V. Scotti. 2003. Discovery and follow-up of Amor Asteroid 2003 EZ<sub>16</sub>. In MPEC 2003-E41.

Larsen, J. A., J. V. Scotti. 2003. Recovery of Amor Asteroid 2000 WJ<sub>10</sub>. In MPEC 2003-U21.

Larsen, J. A., J. V. Scotti. 2003. Recovery of Amor Asteroid 1999 VM<sub>11</sub>. In MPEC 2003-U27.

Larsen, J. A., and A. F. Tubbiolo. 2003. Followup Observations of Asteroids 2001 TD<sub>45</sub>, 2002 PZ<sub>39</sub>, 2003 QO<sub>104</sub>, and (1627). In MPEC 2003-Y49.

McMillan, R. S. 2003. Observations of Comet P/2003 CP7 (LINEAR-NEAT). In MPEC 2003-H16.

McMillan, R. S. 2003. Discovery of Apollo Asteroid 2003 JV<sub>14</sub>. In MPEC 2003-J52.

McMillan, R. S. 2003. Observations of Comet C/2002 U2. In MPEC 2003-K14.

McMillan, R. S. 2003. Incidental observations of Amor Asteroid 1999 VG<sub>22</sub>. In MPEC 2003-S57.

McMillan, R. S. 2003. Followup Observations of Asteroids 2003 UB<sub>10</sub>, 2003 UW<sub>29</sub>, and 2003 WG. In MPEC 2003-W73.

McMillan, R. S. 2003. Followup Observations of Asteroids 2001 SX<sub>169</sub> and 2003 WP<sub>25</sub>. In MPEC 2003-W76.

McMillan, R. S. 2003. Discovery of Small Apollo Asteroid 2003 XV. In MPEC 2003-X28.

McMillan, R. S. 2003. Discovery of Apollo Asteroid 2003 YO<sub>1</sub>. In MPEC 2003-Y25.

McMillan, R. S. 2003. Followup Observations of Asteroids 1998 YQ<sub>11</sub>, 2003 WO<sub>7</sub>, and (4450). In MPEC 2003-Y36.

McMillan, R. S. 2003. Followup Observations of Asteroid 1999 MM. In MPEC 2003-Y41.

McMillan, R. S., A. S. Descour. 2003. Discovery and follow-up of Amor Asteroid 2003 GJ<sub>21</sub>. In MPEC 2003-G38.

McMillan, R. S., A. S. Descour. 2003. Discovery and follow-up of Amor Asteroid 2003 GS<sub>22</sub>. In MPEC 2003-G44.

McMillan, R. S., and A. S. Descour. 2003. Discovery and Followup Observations of Small, Closely-Approaching Aten Asteroid 2003 WT<sub>153</sub>. In MPEC 2003-W75.

- McMillan, R. S., and A. S. Descour. 2003. Recovery of Aten Asteroid 2000 CH<sub>59</sub>. In MPEC 2003-X04.
- McMillan, R. S., and A. S. Descour. 2003. Discovery and Followup Observations of Small Apollo Asteroid 2003 WH<sub>166</sub>. In MPEC 2003-X27.
- McMillan, R. S., and A. S. Descour. 2003. Discovery and Followup Observations of Small Amor Asteroid 2003 YW<sub>1</sub>. In MPEC 2003-Y34.
- McMillan, R. S., A. E. Gleason. 2003. Discovery and follow-up of closely-approaching Apollo Asteroid 2003 HW<sub>10</sub>. In MPEC 2003-H37.
- McMillan, R. S., J. A. Larsen. 2003. Observations of Periodic Comet 66P. In MPEC 2003-H49.
- McMillan, R. S., J. V. Scotti. 2003. Observations of Periodic Comets 31P, 66P, and 88P. In MPEC 2003-H21.
- Montani, J. L. 2003. Precovery observations of Amor Asteroid 2003 MT<sub>2</sub>. In MPEC 2003-Q54.
- Read, M. T. 2003. Discovery of Potentially Hazardous Asteroid 2003 JC<sub>13</sub>. In MPEC 2003-J41.
- Read, M. T. 2003. Discovery of Amor Asteroid 2003 JF<sub>13</sub>. In MPEC 2003-J45.
- Read, M. T. 2003. Discovery of Amor asteroid 2003 MT. In MPEC 2003-M42.
- Read, M. T. 2003. Prediscovery observation of Amor Potentially Hazardous Asteroid 2003 MU. In MPEC 2003-M43.
- Read, M. T. 2003. Follow-up observations of Amor Asteroid 2003 SM<sub>84</sub>. In MPEC 2003-S36.
- Read, M. T., M. Block 2003. Discovery and follow-up of Potentially Hazardous Asteroid 2003 KN<sub>18</sub>. In MPEC 2003-K54.
- Read, M. T., T. Gehrels, A. S. Descour\*. 2003. Discovery and follow-up of small Apollo Asteroid 2003 SN<sub>214</sub>. In MPEC 2003-S77. \*Name misidentified as A. E. Gleason in MPEC.
- Read, M. T., A. E. Gleason. 2003. Discovery and follow-up of Amor Asteroid 2003 FQ<sub>6</sub>. In MPEC 2003-F57.
- Read, M. T., A. E. Gleason. 2003. Discovery and follow-up of Amor Asteroid 2003 FR<sub>6</sub>. In MPEC 2003-F58.
- Scotti, J. V. 2003. Discovery of Apollo Asteroid 2003 BC<sub>44</sub>. In MPEC 2003-B53.
- Scotti, J. V. 2003. Observation of Comet C/2003 A<sub>2</sub>. In MPEC 2003-C07.
- Scotti, J. V. 2003. Recovery of Apollo Asteroid 2001 XV<sub>10</sub>. In MPEC 2003-E50.
- Scotti, J. V. 2003. Recovery of Potentially Hazardous Asteroid 2002 AJ<sub>129</sub>. In MPEC 2003-E51.
- Scotti, J. V. 2003. Recovery of Comet 66P/DU Toit. In MPEC 2003-E57.
- Scotti, J. V. 2003. Astrometric observations of Periodic Comet 66P/DU Toit. In MPEC 2003-G15.
- Scotti, J. V. 2003. Astrometric observations of Periodic Comet P/2003 L<sub>1</sub> (Scotti). In MPEC 2003-M19.
- Scotti, J. V. 2003. Independent rediscovery of Potentially Hazardous Apollo Asteroid 1998 MZ. In MPEC 2003-Q55.
- Scotti, J. V. 2003. Follow-up observations of Asteroids 2000 PJ<sub>6</sub>, 2000 SU<sub>180</sub>, 2000 XG<sub>47</sub>, 2001 TX<sub>1</sub>, 2002 SR<sub>41</sub>, and 2003 MT. In MPEC 2003-Q62.
- Scotti, J. V. 2003. Follow-up observations of Comet 119P. In MPEC 2003-R12.
- Scotti, J. V. 2003. Discovery of Amor Asteroid 2003 SJ<sub>215</sub>. In MPEC 2003-S83.
- Scotti, J. V. 2003. Discovery of small Amor Asteroid 2003 SN<sub>215</sub>. In MPEC 2003-S84.

Scotti, J. V. 2003. Follow-up observations of Periodic Comet P/2003 QX29. In MPEC 2003-S100.

Scotti, J. V. 2003. Observations of Periodic Comets 29P and 121P. In MPEC 2003-S104.

Scotti, J. V. 2003. Follow-up observations of Asteroids 2003 TK and 2003 TX<sub>9</sub>. In MPEC 2003-U22.

Scotti, J. V. 2003. Discovery and follow-up of small Apollo Asteroid 2003 UO<sub>12</sub>. In MPEC 2003-U44.

Scotti, J. V. 2003. Followup Observations of Asteroids 2003 YO<sub>1</sub> and 2003 YQ<sub>94</sub>. In MPEC 2003-Y81.

Scotti, J. V. 2003. Followup Observations of Asteroid 2002 AC<sub>2</sub>. In MPEC 2003-Y96.

Scotti, J. V., M. Block. 2003. Discovery and follow-up astrometry of Amor Asteroid 2003 HU<sub>42</sub>. In MPEC 2003-J05.

Scotti, J. V., M. Block. 2003. Recovery of Amor Asteroid 1999 RV<sub>2</sub>. In MPEC 2003-U51.

Scotti, J. V., M. Block, A. S. Descour. 2003. Discovery and follow-up astrometry of Asteroid 2003 JC<sub>11</sub>. In MPEC 2003-J35.

Scotti, J. V., A. S. Descour. 2003. Discovery and follow-up of Comet C/2003 L1 (Scotti). In MPEC 2003-L33.

Scotti, J. V., T. Gehrels 2003. Discovery and follow-up of Apollo Asteroid 2003 BK<sub>47</sub>. In MPEC 2003-C09.

Scotti, J. V., T. Gehrels 2003. Discovery and follow-up of Apollo Asteroid 2003 BM<sub>47</sub>. In MPEC 2003-C10.

Scotti, J. V., A. E. Gleason. 2003. Follow-up observations of Asteroids 1998 MZ, 2000 TQ<sub>64</sub>, 2000 UL<sub>11</sub>, 2001 RR<sub>17</sub>, 2002 SR<sub>41</sub>, 2003 GR, 2003 SJ<sub>84</sub>, 2003 SN<sub>214</sub>, 2003 SJ<sub>215</sub>, (3352), and (6491). In MPEC 2003-T01.

Scotti, J. V., A. E. Gleason. 2003. Follow-up observations of Asteroids 2003 SC<sub>11</sub>, 2003 SY<sub>17</sub>, 2003 SN<sub>215</sub>, and (10636). In MPEC 2003-T08.

Scotti, J. V., A. E. Gleason. 2003. Recovery of Apollo Asteroid 2001 SA<sub>270</sub>. In MPEC 2003-U06.

Scotti, J. V., A. E. Gleason, M. Block. 2003. Follow-up observations of Asteroids 2000 TQ<sub>64</sub>, 2001 SH<sub>276</sub>, 2003 HP<sub>32</sub>, 2003 HR<sub>32</sub>, 2003 NW<sub>1</sub>, 2003 RS<sub>1</sub>, 2003 SL<sub>5</sub>, 2003 TG<sub>2</sub>, 2003 TH<sub>2</sub>, 2003 UW<sub>5</sub>, 2003 UB<sub>10</sub>, 2003 UC<sub>10</sub>, 2003 UO<sub>12</sub>, (18736), and (65679). In MPEC 2003-U57.

Scotti, J. V., A. E. Gleason, M. Block, J. A. Larsen. 2003. Follow-up observations of Asteroids 2000 FN<sub>10</sub>, 2001 UY<sub>4</sub>, 2003 KR<sub>18</sub>, 2003 NB, 2003 ND, 2003 QQ<sub>10</sub>, 2003 QL<sub>96</sub>, 2003 RM, 2003 SK<sub>36</sub>, 2003 SJ<sub>215</sub>, and 2003 TK. In MPEC 2003-T21.

Scotti, J. V., A. E. Gleason, and A. S. Descour. 2003. Follow-up of Periodic Comet 104P/Kowal. In MPEC 2003-S96.

Scotti, J. V., J. A. Larsen. 2003. Recovery observations of Amor Asteroid 2001 CK<sub>42</sub>. In MPEC 2003-T09.

Scotti, J. V., A. F. Tubbiolo 2003. Follow-up observations of Asteroids 2000 PJ<sub>6</sub> and 2000 SU<sub>180</sub> and incidental observations of Asteroids 1999 DB<sub>7</sub> and (26663). In MPEC 2003-R02.

Scotti, J. V., A. F. Tubbiolo 2003. Follow-up observations of Asteroids 2001 AE<sub>2</sub>, 2003 SN<sub>215</sub>, 2003 TG<sub>2</sub>, (6489), and (6491). In MPEC 2003-U28.

Scotti, J. V., A. F. Tubbiolo and A. E. Gleason. 2003. Follow-up observations of Asteroids 2000 SU<sub>180</sub>, 2000 XG<sub>47</sub>, 2003 QQ<sub>10</sub>, 2003 SJ<sub>215</sub>, 2003 TK, 2003 TK<sub>1</sub>, 2003 SJ<sub>84</sub>, 2003 UW<sub>5</sub>, (3288), and (8037). In MPEC 2003-U40.

Tubbiolo, A. F. 2003. Observations of Comet 53P. In MPEC 2003-L30.

Tubbiolo, A. F. 2003. Prediscovery observations of Apollo Asteroid 2003 TO<sub>9</sub>. In MPEC 2003-T75.

Tubbiolo, A. F. 2003. Incidental follow-up observations of Periodic Comet P/2003 S2 (NEAT). In MPEC 2003-U35.

Tubbiolo, A. F. 2003. Incidental follow-up observations of Periodic Comet 115P. In MPEC 2003-U37.

Tubbiolo, A. F. 2003. Incidental follow-up observations of large Apollo Asteroid 2001 CL<sub>42</sub>. In MPEC 2003-U99.

Tubbiolo, A. F. 2003. Incidental Followup of Comet C/2001 T<sub>4</sub>. In MPEC 2003-W15.

Tubbiolo, A. F. 2003. Observations of Comet C/2001 T<sub>4</sub>. In MPEC 2003-Y74.

Tubbiolo, A. F., M. Block. 2003. Discovery and follow-up of Amor Asteroid 2003 SC<sub>11</sub>. In MPEC 2003-S18.

Tubbiolo, A. F., A. S. Descour, A. E. Gleason. 2003. Discovery and follow-up of large Potentially Hazardous Asteroid 2003 KU<sub>2</sub>. In MPEC 2003-K26.

Tubbiolo, A. F., and T. Gehrels. 2003. Discovery and Followup of Amor Asteroid 2003 WO<sub>7</sub>. In MPEC 2003-W22.

Tubbiolo, A. F., A. E. Gleason. 2003. Discovery and follow-up of Amor Asteroid 2003 SH<sub>84</sub>. In MPEC 2003-S33.

Tubbiolo, A. F., A. E. Gleason. 2003. Discovery and follow-up of Amor Asteroid 2003 SJ<sub>84</sub>. In MPEC 2003-S34.

Tubbiolo, A. F., A. E. Gleason, J. V. Scotti. 2003. Discovery and follow-up observations of small Amor Asteroid 2003 UW<sub>5</sub>. In MPEC 2003-U20.

Tubbiolo, A. F., J. A. Larsen, and M. Block. 2003. Discovery and Followup Observations of Large Apollo Asteroid 2003 YQ<sub>94</sub>. In MPEC 2003-Y73.

Tubbiolo, A. F., J. V. Scotti. 2003. Discovery and follow-up observations of Amor Asteroid 2003 UB<sub>10</sub>. In MPEC 2003-U30.

Tubbiolo, A. F., J. V. Scotti. 2003. Discovery and follow-up observations of small Apollo Asteroid 2003 UC<sub>10</sub>. In MPEC 2003-U31.

#### **MPECs, 2004:**

Block, M. 2004. Followup Observations of Potentially Hazardous Apollo Asteroid 2004 BV<sub>1</sub>. In MPEC 2004-B13.

Block, M. 2004. Discovery and Followup Observations of Small Amor Asteroid 2004 BF<sub>11</sub>. In MPEC 2004-B15.

Block, M. 2004. Discovery and Followup Observations of Small Apollo Asteroid 2004 BH<sub>11</sub>. In MPEC 2004-B17.

Block, M. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 BJ<sub>11</sub>. In MPEC 2004-B18.

Block, M. 2004. Discovery and Followup Observations of Small Amor Asteroid 2004 BK<sub>11</sub>. In MPEC 2004-B19.

Block, M. 2004. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2004 BL<sub>11</sub>. In MPEC 2004-B20.

Block, M. 2004. Recovery of Small Apollo Asteroid 1999 AJ<sub>39</sub>. In MPEC 2004-B22.

Block, M. 2004. Followup Observations of Asteroids 2003 VG<sub>1</sub>, 2003 YS<sub>117</sub>, 2003 YK<sub>118</sub>, and (6456). In MPEC 2004-B25.

Block, M. 2004. Followup Observations of Asteroid 1999 RV<sub>2</sub>. In MPEC 2004-B30.

Block, M. 2004. Recovery of Amor Asteroid 2002 TX<sub>68</sub>. In MPEC 2004-B69.

Block, M. 2004. Followup Observations of Potentially Hazardous Asteroid 2004 DD. In MPEC 2004-D31.

Block, M. 2004. Followup Observations of Asteroids 2003 KU<sub>2</sub>, 2003 NW<sub>1</sub>, and 2003 YX<sub>1</sub>. In MPEC 2004-E44.

Block, M. 2004. Discovery of Small Apollo Asteroid 2004 FA. In MPEC 2004-F10.

Block, M. 2004. Followup Observations of Asteroids 2002 AJ<sub>129</sub>, 2003 MD<sub>7</sub>, 2004 AR<sub>1</sub>, and 2004 DD. In MPEC 2004-F62.

Block, M. 2004. Recovery of Large Potentially Hazardous Apollo Asteroid 2003 CJ<sub>11</sub>. In MPEC 2004-F64.

Block, M. 2004. Followup Observations of Virtual Impactor Asteroid 2004 FU<sub>4</sub>. In MPEC 2004-F67.

Block, M. 2004. Followup Observations of Asteroids 2003 YK and 2004 CH<sub>52</sub>. In MPEC 2004-H22.

Block, M. 2004. Recovery of Potentially Hazardous Aten Asteroid 2002 JX<sub>8</sub>. In MPEC 2004-H28.

Block, M. 2004. Followup Observations of Asteroids 2000 TO<sub>64</sub> and 2004 HM. In MPEC 2004-K08.

Block, M. 2004. Incidental Followup Observations of Asteroid (3551). In MPEC 2004-L48.

Block, M. 2004. Incidental Followup Observations of Asteroid 2002 LY<sub>45</sub>. In MPEC 2004-L52.

Block, M. 2004. Discovery and Followup Observations of Amor Asteroid 2004 LA<sub>6</sub>. In MPEC 2004-L56.

Block, M. 2004. Incidental Followup of Asteroid 2004 KZ<sub>14</sub>. In MPEC 2004-L65.

Block, M. 2004. Followup Observation of Small, Fast-Moving Amor Asteroid 2004 LA<sub>10</sub>. In MPEC 2004-M01.

Block, M. 2004. Incidental Followup Observations of Asteroids 2001 XP<sub>88</sub>, 2003 AB<sub>23</sub>, and (68348). In MPEC 2004-M41.

Block, M. 2004. Incidental Followup Observations of Periodic Comet P/2004 H<sub>2</sub>(Larsen). In MPEC 2004-M48.

Block, M. 2004. Prediscovery Observations of Potentially Hazardous Apollo Asteroid 2004 OB. In MPEC 2004-O13.

Block, M. 2004. Incidental Followup Observations of Asteroids 2000 RJ<sub>34</sub>, 2004 FZ<sub>1</sub>, and (4183). In MPEC 2004-Q38.



Block, M. 2004. Discovery of Potentially Hazardous Apollo Asteroid 2004 QB<sub>17</sub>. In MPEC 2004-Q51.

Block, M. 2004. Incidental Recovery Observations of Large Apollo Asteroid 2002 PQ<sub>142</sub>. In MPEC 2004-R25.

Block, M. 2004. Followup Observations of Amor Asteroid 2001 FY. In MPEC 2004-S12.

Block, M. 2004. Recovery Observations of Amor Asteroid 2003 AJ<sub>73</sub>. In MPEC 2004-T22.

Block, M. 2004. Followup Observations of Apollo Asteroid 2004 TN, listed as a Virtual Impactor. In MPEC 2004-T24.

Block, M. 2004. Recovery Observations of Amor Asteroid 2002 CZ<sub>58</sub>. In MPEC 2004-T26.

Block, M. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 TG<sub>10</sub>. In MPEC 2004-T33.

Block, M. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 TK<sub>10</sub>. In MPEC 2004-T36.

Block, M. 2004. Followup Observations of Asteroid 2004 TD<sub>18</sub>. In MPEC 2004-U03.

Block, M. 2004. Followup Observations of Asteroids 2004 TK<sub>10</sub> and 2004 TT<sub>12</sub>. In MPEC 2004-U18.

Block, M. 2004. Followup Observations of Asteroids 1998 HL<sub>3</sub>, 1999 FN<sub>53</sub>, 2000 AF<sub>6</sub>, 2002 CQ<sub>11</sub>, 2004 EU<sub>9</sub>, 2004 NL<sub>8</sub>, 2004 OT<sub>11</sub>, 2004 QV<sub>16</sub>, 2004 TN, 2004 TC<sub>10</sub>, 2004 TR<sub>13</sub>, and 2004 XK<sub>3</sub>. In MPEC 2004-X37.

Block, M., and T. H. Bressi. 2004. Recovery of Potentially Hazardous Apollo Asteroid 2001 DF<sub>47</sub>. In MPEC 2004-K20.

Block, M., and T. H. Bressi. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 MB<sub>6</sub>. In MPEC 2004-M55.

Block, M., T. H. Bressi, and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2004 ST<sub>9</sub>, 2004 TG<sub>10</sub>, 2004 TT<sub>12</sub>, and 2004 TD<sub>18</sub>. In MPEC 2004-U28.

Block, M. and R. H. Broad. 2004. Discovery and Followup Observations of Small, Fast-Moving Amor Asteroid 2004 QJ<sub>13</sub>. In MPEC 2004-Q42.

Block, M., and A. S. Descour. 2004. Recovery of Apollo Asteroid 1999 GY<sub>5</sub>. In MPEC 2004-H36.

Block, M., A. S. Descour, J. A. Larsen, and R. S. McMillan. 2004. Recovery Observations of Potentially Hazardous Amor Asteroid 2004 BG<sub>121</sub>. In MPEC 2004-R49.

Block, M., R. C. Klein, and T. H. Bressi. 2004. Discovery and Followup Observations of Small, Fast-Moving Apollo Asteroid 2004 TJ<sub>10</sub>. In MPEC 2004-T35.

Block, M., and P. B. Lake. 2004. Recovery of Potentially Hazardous Apollo Asteroid 2000 EV<sub>70</sub>. In MPEC 2004-E11.

Block, M., J. A. Larsen, M.T. Read, and J. V. Scotti. 2004. Archival Followup of Amor Asteroid 2004 BG<sub>121</sub> and Incidental Followup of Asteroids 1999 GT<sub>6</sub>, 2002 PQ<sub>142</sub>, 2004 PE<sub>20</sub>, and 2004 QG<sub>20</sub>. In MPEC 2004-R52.

Block, M., R. S. McMillan, and J. A. Larsen. 2004. Recovery Observations of Amor Asteroid 2001 PF<sub>14</sub>. In MPEC 2004-J01.

Block, M., and R. S. McMillan. 2004. Followup Observations of Asteroids 1999 GT<sub>6</sub>, 2000 VE<sub>62</sub>, and 2004 TN. In MPEC 2004-T39.

- Block, M., and K. W. Pavitt. 2004. Discovery of Small, Fast-Moving Amor Asteroid 2004 LA<sub>10</sub>. In MPEC 2004-L66.
- Block, M., and M. T. Read. 2004. Followup Observations of Asteroids 2000 JG<sub>5</sub>, 2004 RS<sub>25</sub>, and 2004 RQ<sub>109</sub>. In MPEC 2004-S01.
- Block, M., M. T. Read, E. Guido, and S. M. Vaast. 2004. Followup Observations of Asteroids 2001 GN<sub>2</sub>, 2001 SX<sub>169</sub>, 2002 PZ<sub>39</sub>, 2003 QO<sub>104</sub>, 2003 UX<sub>34</sub>, 2004 PE<sub>20</sub>, 2004 RS<sub>109</sub>, 2004 RG<sub>164</sub>, 2004 RX<sub>10</sub>, 2004 RW<sub>164</sub>, and (85182). In MPEC 2004-S06.
- Block, M., and M. T. Read. 2004. Followup Observations of Asteroids 2002 OD<sub>20</sub>, 2002 XH<sub>4</sub>, and 2004 RS<sub>25</sub>. In MPEC 2004-S16.
- Block, M., M. T. Read, J. V. Scotti, and A. F. Tubbiolo. 2004. Observations of Comets C/2002 V2, 116P, and 120P. In MPEC 2004-S34.
- Block, M., and J. V. Scotti. 2004. Followup Observations of Asteroids 2003 YR<sub>70</sub>, 2004 BN<sub>41</sub>, 2004 BA<sub>75</sub>, (8507), (8567), and (18109). In MPEC 2004-B76.
- Block, M., and J. V. Scotti. 2004. Followup Observations of Asteroid 2002 FB<sub>6</sub>. In MPEC 2004-F01.
- Block, M., and J. V. Scotti. 2004. Followup Observations of Asteroids 2003 KU<sub>2</sub>, 2003 QM<sub>47</sub>, and 2003 UX<sub>5</sub>. In MPEC 2004-F02.
- Block, M., and J. V. Scotti. 2004. Followup Observations of Potentially Hazardous Apollo Asteroid 2003 JC<sub>13</sub>. In MPEC 2004-F03.
- Block, M., and J. V. Scotti. 2004. Recovery of Potentially Hazardous Apollo Asteroid 2000 EK<sub>26</sub>. In MPEC 2004-F04.
- Block, M., and J. V. Scotti. 2004. Recovery of Apollo Asteroid 2003 CA. In MPEC 2004-F18.
- Block, M., and J. V. Scotti. 2004. Discovery and Followup Observations of Small Apollo Asteroid 2004 FD. In MPEC 2004-F19.
- Block, M., J. V. Scotti, and A. F. Tubbiolo. 2004. Discovery and Followup Observations of Mars-Crosser Asteroid 2004 LH<sub>18</sub>. In MPEC 2004-M06.
- Block, M., and J. V. Scotti. 2004. Recovery Observations of Amor Asteroid 2002 XP<sub>40</sub>. In MPEC 2004-T70.
- Block, M., and J. V. Scotti. 2004. Followup Observations of Asteroids 1991 BN, 1999 FP<sub>59</sub>, 2000 WN<sub>63</sub>, 2000 YN<sub>29</sub>, 2004 MP<sub>3</sub>, 2004 SU<sub>55</sub>, and (3671). In MPEC 2004-X51.
- Block, M., and J. V. Scotti. 2004. Followup Observations of Asteroids 1999 FP<sub>59</sub>, 2004 JB<sub>12</sub>, 2004 MQ<sub>1</sub>, and 2004 VZ<sub>60</sub>. In MPEC 2004-X61.
- Block, M., A. F. Tubbiolo, A. E. Gleason. 2004. Followup Observations of Comets C/2003 A<sub>2</sub>, 117P, 118P, and 157P. In MPEC 2004-F92.
- Bressi, T. H. 2004. Followup Observations of Asteroids 2004 DC and 2004 DV<sub>24</sub>. In MPEC 2004-E01.
- Bressi, T. H. 2004. Followup Observations of Asteroids 1998 HL<sub>3</sub> and 2001 VK<sub>5</sub>. In MPEC 2004-E10.
- Bressi, T. H. 2004. Discovery and Followup Observations of Amor Asteroid 2004 FP<sub>146</sub>. In MPEC 2004-G18.
- Bressi, T. H. 2004. Followup Observations of Asteroid 2000 TO<sub>64</sub>. In MPEC 2004-J02.
- Bressi, T. H. 2004. Followup Observations of Asteroids 2002 LY<sub>45</sub>, 2002 TR<sub>190</sub>, and 2004 HZ. In MPEC 2004-J16.

- Bressi, T. H. 2004. Followup Observations of Comet C/2004 HV<sub>60</sub>(Spacewatch). In MPEC 2004-J34
- Bressi, T. H. 2004. Followup Observations of Asteroid 2001 YV<sub>3</sub>. In MPEC 2004-K31
- Bressi, T. H. 2004. Followup Observations of Asteroid 2002 JV<sub>15</sub>. In MPEC 2004-K59
- Bressi, T. H. 2004. Recovery of Potentially Hazardous Aten Asteroid 1999 MN, a Radar Target. In MPEC 2004-K62
- Bressi, T. H. 2004. Followup Observations of Asteroid 2001 QQ<sub>142</sub>. In MPEC 2004-K63
- Bressi, T. H. 2004. Followup Observations of Periodic Comet P/2004 A<sub>1</sub>. In MPEC 2004-L46
- Bressi, T. H. 2004. Discovery and Followup Observations of Small Amor Asteroid 2004 ME<sub>6</sub>. In MPEC 2004-M59
- Bressi, T. H. 2004. Followup Observations of Potentially Hazardous Aten Asteroid 1999 MN, a Radar Target. In MPEC 2004-M64.
- Bressi, T. H. 2004. Incidental Followup Observations of Asteroids 2004 RX<sub>10</sub> and (85182). In MPEC 2004-S52.
- Bressi, T. H. 2004. Followup Observations of Asteroid 2003 KN<sub>18</sub>. In MPEC 2004-S59.
- Bressi, T. H. 2004. Followup Observations of Asteroids 1999 FN<sub>53</sub>, 2003 KN<sub>18</sub>, and 2004 MX<sub>2</sub>. In MPEC 2004-U37.
- Bressi, T. H. 2004. Followup Observations of Asteroid 2003 QO<sub>104</sub>. In MPEC 2004-U40.
- Bressi, T. H., and M. Block. 2004. Followup Observations of Asteroids 2002 PZ<sub>39</sub>, 2004 ST<sub>9</sub>, and 2004 TN<sub>1</sub>. In MPEC 2004-T27.
- Bressi, T. H., and A. E. Gleason. 2004. Followup Observations of Asteroids 2004 DK<sub>1</sub>, 2004 FE<sub>31</sub>, and (2061). In MPEC 2004-H85.
- Bressi, T. H., M. Kuczewski, and R. S. McMillan. 2004. Discovery and Followup Observations of Small Fast-moving Apollo Asteroid 2004 ST<sub>26</sub>. In MPEC 2004-S55.
- Bressi, T. H., and J. A. Larsen. 2004. Followup Observations of Asteroids 2004 BV<sub>1</sub>, 2004 BW<sub>1</sub>, and 2004 BV<sub>18</sub>. In MPEC 2004-B31.
- Bressi, T. H., and J. A. Larsen. 2004. Followup Astrometry of Asteroids 1997 EH<sub>29</sub>, 1998 HL<sub>03</sub>, 1998 QA<sub>01</sub>, 2003 YO<sub>01</sub>, 2004 DV<sub>24</sub>, 2004 FU<sub>04</sub>, 2004 FJ<sub>11</sub>, and 2004 FE<sub>31</sub>. In MPEC 2004-G06.
- Bressi, T. H., and R. S. McMillan. 2004. Followup Observations of Asteroids 2000 RJ<sub>34</sub>, 2004 FJ<sub>11</sub>, and (85182). In MPEC 2004-S47.
- Bressi, T. H., and M. T. Read. 2004. Recovery Observations of Amor Asteroid 2000 TV<sub>28</sub>. In MPEC 2004-V14.
- Bressi, T. H., and J. V. Scotti. 2004. Followup Observations of Asteroids 2003 BD<sub>44</sub>, 2003 WP<sub>25</sub>, (4486), and (52768). In MPEC 2004-W27.
- Bressi, T. H., A. F. Tubbiolo, R. S. McMillan, A. S. Descour. 2004. Discovery and Followup Observations of Small Amor Asteroid 2004 JB. In MPEC 2004-J30.
- Cochran, K. C., R. S. McMillan, M. Block. 2004. Followup Observations of Potentially Hazardous Apollo Asteroid 2003 YM<sub>137</sub>. In MPEC 2004-B12.
- Descour, A. S. 2004. Prediscovery Observations of Period Comet P/2004 A<sub>1</sub>. In MPEC 2004-A51.
- Descour, A. S. 2004. Followup Observations of Asteroid 2003 WR<sub>21</sub>. In MPEC 2004-C41.
- Descour, A. S. 2004. Followup Observations of Asteroid 2003 UD<sub>8</sub>. In MPEC 2004-C55.
- Descour, A. S. 2004. Followup Observations of Asteroid 2004 HD<sub>2</sub>. In MPEC 2004-J41.

Descour, A. S. 2004. Recovery Observations of Potentially Hazardous Amor Asteroid 2002 PF<sub>43</sub>. In MPEC 2004-K49.

Descour, A. S. 2004. Followup Observations of Asteroid 2004 TN. In MPEC 2004-T17.

Descour, A. S. 2004. Incidental Followup Observations of Comets C/2001 T<sub>4</sub>, 78P, and 119P. In MPEC 2004-V80.

Descour, A. S. 2004. Followup Observations of Asteroid 2004 UR<sub>1</sub>. In MPEC 2004-X04.

Descour, A. S. 2004. Followup Observations of Asteroids 1999 VP<sub>11</sub>, 2000 OJ<sub>8</sub>, 2000 QK<sub>130</sub>, 2001 UY<sub>4</sub>, 2001 XU<sub>10</sub>, 2003 QO<sub>104</sub>, 2003 WP<sub>25</sub>, and (19764). In MPEC 2004-X09.

Descour, A. S. 2004. Followup Observations of Asteroid 2000 LB<sub>16</sub>. In MPEC 2004-Y26.

Descour, A. S. 2004. Followup Observations of Asteroid 2004 XM<sub>29</sub>. In MPEC 2004-Y30.

Descour, A. S., and T. H. Bressi. 2004. Followup Observations of Periodic Comet P/2001 YX<sub>127</sub>. In MPEC 2004-J14.

Descour, A. S., and T. Gehrels. 2004. Discovery and Followup of Amor Asteroid 2004 CR<sub>2</sub>. In MPEC 2004-C57.

Descour, A. S., and T. Gehrels. 2004. Recovery Observations of Amor Asteroid 2000 WK<sub>107</sub>. In MPEC 2004-V53.

Descour, A. S., J. A. Larsen, and M. Block. 2004. Recovery of Amor Asteroid 2000 BG<sub>19</sub>. In MPEC 2004-B67.

Descour, A. S., and J. A. Larsen. 2004. Followup Observations of Asteroids 2003 UX<sub>5</sub> and 2003 YT<sub>124</sub>. In MPEC 2004-C51.

Descour, A. S., and J. A. Larsen. 2004. Followup Observations of Asteroids 2000 EK<sub>26</sub>, 2000 FO<sub>10</sub>, 2000 PD<sub>3</sub>, 2001 QQ<sub>142</sub>, 2003 UX<sub>5</sub>, 2004 EM<sub>20</sub>, 2004 FD<sub>4</sub>, (24475), and (27031). In MPEC 2004-H39.

Descour, A. S., and J. A. Larsen. 2004. Followup Observations of Asteroids 1998 BB<sub>10</sub>, 2004 BX<sub>58</sub>, and (2061). In MPEC 2004-H44.

Descour, A. S., and J. A. Larsen. 2004. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2004 HE<sub>12</sub>. In MPEC 2004-H45.

Descour, A. S., and J. A. Larsen. 2004. Followup Observations of Asteroids 2000 EV<sub>70</sub> and 2004 FN<sub>18</sub>. In MPEC 2004-H52.

Descour, A. S., and J. A. Larsen. Prediscovery Observations of Potentially Hazardous Virtual Impactor Aten Asteroid 2004 MN<sub>4</sub>. In MPEC 2004-Y70.

Descour, A. S., and R. S. McMillan. 2004. Followup Observations of Potentially Hazardous Amor Asteroid 2001 US<sub>16</sub>. In MPEC 2004-Q19.

Descour, A. S., R. S. McMillan, J. Manek, and M. Block. 2004. Discovery and Followup Observations of Small, Fast-Moving Apollo Asteroid 2004 QR<sub>4</sub>. In MPEC 2004-Q32.

Descour, A. S., and R. S. McMillan. 2004. Incidental Followup Observations of Asteroid 2000 QJ<sub>1</sub>. In MPEC 2004-Q59.

Descour, A. S., and R. S. McMillan. 2004. Followup Observations of Asteroids 2004 NC<sub>9</sub>, 2004 TN, 2004 TA<sub>1</sub>, 2004 TN<sub>1</sub>, 2004 TE<sub>8</sub>, and 2004 TK<sub>10</sub>. In MPEC 2004-V13.

Descour, A. S., and M. T. Read. 2004. Followup Observations of Asteroids 2004 EO<sub>20</sub> and (5626). In MPEC 2004-F55.

Descour, A. S., and M. T. Read. 2004. Followup Observations of Asteroids 1998 QA<sub>1</sub>, 2000 TV<sub>28</sub>, 2001 SO<sub>73</sub>, 2001 SX<sub>169</sub>, 2001 XN<sub>254</sub>, 2004 KA, 2004 RL<sub>251</sub>, 2004 RN<sub>335</sub>, 2004 SB<sub>20</sub>, 2004 TT<sub>12</sub>, 2004 TO<sub>20</sub>, and (4486). In MPEC 2004-V22.

Descour, A. S., J. V. Scotti, and A. J. Walker. 2004. Followup Observations of Asteroids 2004 HW, 2004 HA<sub>1</sub>, 2004 HM<sub>1</sub>, 2004 HE<sub>12</sub>, and (5370). In MPEC 2004-H61.

Descour, A. S., A. F. Tubbiolo, T. H. Bressi, and J. A. Larsen. 2004. Followup Observations of Asteroids 1991 RJ<sub>2</sub>, 2002 JX<sub>8</sub>, 2004 HQ<sub>1</sub>, 2004 HF<sub>12</sub>, (05869), (07336), and (07753). In MPEC 2004-K22.

Descour, A. S., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2001 HB, 2003 UX<sub>5</sub>, 2004 CD<sub>39</sub>, 2004 GB<sub>2</sub>, and 2004 JW<sub>20</sub>. In MPEC 2004-K48.

Descour, A. S., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2004 QF<sub>14</sub>, 2004 RK<sub>9</sub>, 2004 RW<sub>10</sub>, 2004 RG<sub>164</sub>, and (52689). In MPEC 2004-T13.

Descour, A. S., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2003 KN<sub>18</sub>, 2004 RC<sub>11</sub>, and (2212). In MPEC 2004-T21.

Gehrels, T. 2004. Followup Observations of Apollo Asteroid 2004 FA<sub>18</sub>. In MPEC 2004-F75.

Gehrels, T. 2004. Followup Observations of Asteroid 2004 HC<sub>33</sub>. In MPEC 2004-F78.

Gehrels, T., and Descour, A. S. 2004. Followup Observations of Asteroids 1994 VA<sub>1</sub>, 2001 SF<sub>286</sub>, 2004 TG<sub>10</sub>, (4486), and (87024). In MPEC 2004-V54.

Gehrels, T., and A. E. Gleason. 2004. Followup Observations of Virtual Impactor Asteroid 2004 FU<sub>4</sub>, (12923), and (18109). In MPEC 2004-F75.

Gehrels, T., and J. A. Larsen. 2004. Followup Observations of Asteroids 2000 AF<sub>6</sub>, 2003 SJ<sub>215</sub>, and (23714). In MPEC 2004-C58.

Gehrels, T., and R. S. McMillan. 2004. Followup Observations of Asteroids 2004 BF<sub>11</sub>, 2004 BK<sub>11</sub>, 2004 BW<sub>58</sub>, (6456), and (12923). In MPEC 2004-D01.

Gehrels, T., and M. T. Read. 2004. Followup Observations of Asteroids 1999 YC, 2000 WK<sub>107</sub>, 2004 PE<sub>20</sub>, 2004 TG<sub>10</sub>, 2004 TD<sub>18</sub>, and 2004 TE<sub>18</sub>. In MPEC 2004-V56.

Gehrels, T., and M. T. Read. 2004. Followup Observations of Asteroids 2000 YN<sub>29</sub>, 2004 QQ, 2004 VD<sub>17</sub>, 2004 XK<sub>3</sub>, and 2004 XO<sub>29</sub>. In MPEC 2004-Y03.

Gehrels, T., and J. V. Scotti. 2004. Followup Observations of Asteroids 2000 FO<sub>10</sub> and 2002 EB<sub>3</sub>. In MPEC 2004-H70.

Gleason, A. E. 2004. Discovery and Followup of Small Apollo Asteroid 2004 AE<sub>6</sub>. In MPEC 2004-B04.

Gleason, A. E. 2004. Followup Observations of Periodic Comet P/2002 T<sub>5</sub>. In MPEC 2004-B28.

Gleason, A. E. 2004. Recovery of Potentially Hazardous Apollo Asteroid 2003 MS<sub>2</sub>. In MPEC 2004-B75.

Gleason, A. E. 2004. Discovery of Small Apollo Asteroid 2004 DL<sub>1</sub>. In MPEC 2004-D12.

Gleason, A. E. 2004. Discovery of Centaur Asteroid 2004 DO<sub>29</sub>. In MPEC 2004-D45.

Gleason, A. E. 2004. Followup Observations of Comet 118P. In MPEC 2004-F37.

Gleason, A. E. 2004. Followup Observations of Comet C/2004 C<sub>1</sub> (Larsen). In MPEC 2004-F89.

Gleason, A. E. 2004. Incidental Followup Observations of Asteroid 2000 EV<sub>70</sub>. In MPEC 2004-G08.

Gleason, A. E. 2004. Followup Observations of Asteroids 1998 QA<sub>1</sub>, 2003 WE<sub>157</sub>, and 2004 HM. In MPEC 2004-J36.

- Gleason, A. E. 2004. Followup Observations of Asteroids 2004 CR<sub>2</sub> and 2004 GU<sub>9</sub>. In MPEC 2004-J53.
- Gleason, A. E. 2004. Followup Observations of Asteroids 1998 FG<sub>2</sub>, 2002 FB<sub>3</sub>, and 2004 HM. In MPEC 2004-J61.
- Gleason, A. E., M. C. Begam, M. Block. 2004. Discovery and Followup Observations of Small, Fast-Moving Apollo Asteroid 2004 FC<sub>18</sub>. In MPEC 2004-F78.
- Gleason, A. E., and M. Block. 2004. Followup Observations of Asteroids 1997 AP<sub>10</sub>, 2003 YK<sub>118</sub>, and 2004 AE<sub>6</sub>. In MPEC 2004-B06.
- Gleason, A. E., and M. Block. 2004. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2004 BV<sub>1</sub>. In MPEC 2004-B08.
- Gleason, A. E., and M. Block. 2004. Discovery and Followup of Amor Asteroid 2004 BW<sub>1</sub>. In MPEC 2004-B09.
- Gleason, A. E., M. Block, and J. V. Scotti. 2004. Followup Observations of Asteroids 2001 VS<sub>78</sub>, 2003 NW<sub>1</sub>, 2004 CH<sub>52</sub>, 2004 EH<sub>1</sub>, and (5836). In MPEC 2004-F17.
- Gleason, A. E., and M. Block. 2004. Followup Observations of Asteroids 2002 AP<sub>7</sub> and 2004 JQ<sub>1</sub>. In MPEC 2004-J68.
- Gleason, A. E., and M. Block. 2004. Recovery Observations of Potentially Hazardous Apollo Asteroid 2003 HF<sub>2</sub>. In MPEC 2004-J76.
- Gleason, A. E., and M. Block. 2004. Recovery of Amor Asteroid 2002 XX<sub>4</sub>. In MPEC 2004-K13.
- Gleason, A. E., and T. H. Bressi. 2004. Recovery Observations of Amor Asteroid 2002 NA<sub>31</sub>. In MPEC 2004-K60.
- Gleason, A. E., and T. Gehrels. 2004. Followup Observations of Asteroids 1994 AB<sub>1</sub>, 2003 CA, 2003 JC<sub>13</sub>, 2003 QZ<sub>30</sub>, and 2004 DD. In MPEC 2004-F72.
- Gleason, A. E., J. A. Larsen, M. Block, A. S. Descour, T. Gehrels. 2004. Discovery and Followup Observations of Trans-Neptunian Object 2004 EW<sub>95</sub>. In MPEC 2004-H76.
- Gleason, A. E., and R. S. McMillan. 2004. Followup Observations of Asteroids 2003 VG<sub>1</sub> and 2004 BW<sub>58</sub>. In MPEC 2004-D02.
- Gleason, A. E., and J. V. Scotti. 2004. Discovery and Followup Observations of Large, Potentially Hazardous Apollo Asteroid 2004 DD. In MPEC 2004-D07.
- Gleason, A. E., and J. V. Scotti. 2004. Discovery and Followup Observations of Amor Asteroid 2004 ET<sub>21</sub>. In MPEC 2004-F21.
- Gleason, A. E., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2004 BF<sub>11</sub> and (8034). In MPEC 2004-D32.
- Gleason, A. E. 2004. Followup Observations of Large Amor Asteroid 2003 BC<sub>21</sub>. In MPEC 2004-P05.
- Jedicke, R., 2004. Precovery Observations of Apollo Asteroid 2003 YO<sub>1</sub>. In MPEC 2004-A37.
- Jedicke, R. 2004. Prediscovery Observations of Amor Asteroid 2002 VT<sub>85</sub>. In MPEC 2004-O30.
- Larsen, J. A. 2004. Followup Observations of Comet P/2002 T<sub>5</sub>. In MPEC 2004-A17.
- Larsen, J. A. 2004. Followup Observations of Periodic Comet P/2004 A<sub>1</sub>. In MPEC 2004-D23.
- Larsen, J. A. 2004. Followup Observations of Apollo Asteroid 2004 FN<sub>18</sub>. In MPEC 2004-F80.
- Larsen, J. A. 2004. Followup Observations of Asteroids 2002 FG<sub>7</sub>, 2003 MA<sub>3</sub>, 2003 SS<sub>84</sub>, 2004 FU<sub>4</sub>, and 2004 FC<sub>18</sub>. In MPEC 2004-F84.

- Larsen, J. A. 2004. Recovery of Potentially Hazardous Aten Asteroid 2003 GS. In MPEC 2004-G04.
- Larsen, J. A. 2004. Prediscovery Observations of Large Amor Asteroid 2004 HM<sub>1</sub> = 1995 SP<sub>4</sub>. In MPEC 2004-H50.
- Larsen, J. A. 2004. Discovery of Periodic Comet P/2004 H<sub>3</sub>. In MPEC 2004-H66.
- Larsen, J. A. 2004. Followup Observations of Large Amor Asteroid 2004 FN<sub>18</sub>. In MPEC 2004-H67.
- Larsen, J. A. 2004. Prediscovery Observations of Amor Asteroid 2004 JW<sub>6</sub>. In MPEC 2004-J62.
- Larsen, J. A. 2004. Discovery and Followup Observations of Amor Asteroid 2004 KE<sub>1</sub>. In MPEC 2004-K28.
- Larsen, J. A. 2004. Discovery and Followup Observations of Small Amor Asteroid 2004 KN<sub>10</sub>. In MPEC 2004-K45.
- Larsen, J. A., and M. Block. 2004. Recovery of Potentially Hazardous Amor Asteroid 2001 US<sub>16</sub>. In MPEC 2004-B68.
- Larsen, J. A., and M. Block. 2004. Prediscovery Observations of Potentially Hazardous Apollo Asteroid 2003 WH<sub>166</sub>. In MPEC 2004-K56.
- Larsen, J. A., and T. H. Bressi. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 FN<sub>32</sub>. In MPEC 2004-G05.
- Larsen, J. A., and A. S. Descour. 2004. Discovery and Followup of Small Apollo Asteroid 2004 CZ<sub>1</sub>. In MPEC 2004-C49.
- Larsen, J. A., and A. S. Descour. 2004. Discovery and Followup of Comet C/2004 C1 (Larsen). In MPEC 2004-C52.
- Larsen, J. A., and A. S. Descour. 2004. Discovery and Followup Observations of Periodic Comet P/2004 H<sub>2</sub> (Larsen). In MPEC 2004-H42.
- Larsen, J. A., and A. S. Descour. 2004. Followup Observations of Asteroids (37336) and 2004 BW<sub>58</sub>. In MPEC 2004-K46.
- Larsen, J. A., A. E. Gleason, A. S. Descour. 2004. Followup Observations of Asteroids 2000 HA<sub>24</sub>, 2002 SR<sub>41</sub>, and 2004 KE<sub>1</sub>. In MPEC 2004-K52.
- Larsen, J. A., R. S. McMillan, J. V. Scotti, M. Block, A. E. Gleason. 2004. Discovery and Followup of Centaur or Scattered Disk Object 2004 CM<sub>111</sub>. In MPEC 2004-D37.
- Larsen, J. A., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 1993 VD, 1998 QA<sub>1</sub>, 2000 QW<sub>7</sub>, 2001 VK<sub>5</sub>, 2002 HK<sub>12</sub>, 2003 HR<sub>32</sub>, 2003 YO<sub>1</sub>, 2003 NW<sub>1</sub>, 2003 TO<sub>9</sub>, 2004 AE<sub>6</sub>, 2004 BV<sub>1</sub>, 2004 BW<sub>1</sub>, 2004 BF<sub>11</sub>, 2004 BH<sub>11</sub>, 2004 BJ<sub>11</sub>, 2004 BK<sub>11</sub>, 2004 BL<sub>11</sub>, 2004 BN<sub>41</sub>, 2004 BO<sub>41</sub>, 2004 BW<sub>58</sub>, and (25143). In MPEC 2004-B62.
- Larsen, J. A., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 1997 AE<sub>12</sub>, 1999 RV<sub>2</sub>, 2000 PD<sub>3</sub>, 2000 RS<sub>11</sub>, 2001 AA<sub>50</sub>, 2001 RA<sub>12</sub>, and (8567). In MPEC 2004-B66.
- McMillan, R. S. 2004. Followup Observations of Asteroid 1998 QA<sub>1</sub>. In MPEC 2004-E41.
- McMillan, R. S. 2004. Followup Observations of Small Apollo Asteroid 2004 FX<sub>1</sub>. In MPEC 2004-F32.
- McMillan, R. S. 2004. Incidental Followup Observations of Apollo Asteroid 2004 BD<sub>68</sub>. In MPEC 2004-F51.
- McMillan, R. S. 2004. Incidental Observations of Periodic Comet P/2004 F<sub>3</sub> (NEAT). In MPEC 2004-F51.

McMillan, R. S. 2004. Incidental Followup Observations of Asteroid (5626). In MPEC 2004-H27.

McMillan, R. S. 2004. Incidental Followup Observations of Asteroid 2004 BE<sub>86</sub>. In MPEC 2004-M05.

McMillan, R. S. 2004. Incidental Followup Observations of Asteroids 2004 MO<sub>1</sub> and (3551). In MPEC 2004-M31.

McMillan, R. S. 2004. Incidental Followup Observations of Comet C/2002 V<sub>2</sub>. In MPEC 2004-S71.

McMillan, R. S. 2004. Incidental Observations of Periodic Comet 78P. In MPEC 2004-T51.

McMillan, R. S. 2004. Incidental Observations of Comet 131P. In MPEC 2004-U36.

McMillan, R. S. 2004. Followup Observations of Asteroids 2004 TB<sub>10</sub> and 2004 TD<sub>18</sub>. In MPEC 2004-V11.

McMillan, R. S. 2004. Followup Observations of Asteroids 2004 XK<sub>3</sub> and 2004 XM<sub>29</sub>. In MPEC 2004-Y20.

McMillan, R. S., and M. Block. 2004. Prediscovery and Postdiscovery Observations of Periodic Comet P/2004 A<sub>1</sub>. In MPEC 2004-B27.

McMillan, R. S., and M. Block. 2004. Discovery and Prediscovery Observations of Centaur Asteroid 2004 CJ<sub>39</sub>. In MPEC 2004-C62.

McMillan, R. S., M. Block, and J. A. Larsen. 2004. Followup Observations of Asteroids 2003 SR<sub>15</sub>, 2003 SU<sub>214</sub>, 2004 FJ<sub>11</sub>, and 2004 FE<sub>31</sub>. In MPEC 2004-H33.

McMillan, R. S., M. Block, and J. V. Scotti. 2004. Discovery and Followup Observations of Small, Fast-Moving Amor Asteroid 2004 TV<sub>11</sub>. In MPEC 2004-T41.

McMillan, R. S., and T. H. Bressi. 2004. Discovery and Followup Observations of Small, Fast-moving Aten Asteroid 2004 SW<sub>26</sub>. In MPEC 2004-S58.

McMillan, R. S., L. S. Garrett, M. Block, and A. S. Descour. 2004. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2004 MO<sub>1</sub>. In MPEC 2004-M25.

McMillan, R. S., and J. A. Larsen. 2004. Incidental Followup Observations of Asteroid 2004 QQ. In MPEC 2004-Y26.

McMillan, R. S., and J. A. Larsen. 2004. Incidental Observations of Periodic Comets 32P and 129P. In MPEC 2004-Y58.

McMillan, R. S., E. P. Majden, M. T. Read, M. Block. 2004. Discovery and Followup Observations of Small, Fast-Moving Apollo Asteroid 2004 MV<sub>2</sub>. In MPEC 2004-M34.

McMillan, R. S., S. B. Pope, A. S. Descour, and J. A. Larsen. 2004. Discovery and Followup Observations of Small, Fast-moving Apollo Asteroid 2004 YD<sub>5</sub>. In MPEC 2004-Y35.

McMillan, R. S., and J. V. Scotti. 2004. Discovery and Followup Observations of Small Amor Asteroid 2004 TT<sub>12</sub>. In MPEC 2004-T54.

McMillan, R. S., and J. V. Scotti. 2004. Incidental Followup Observations of Asteroids 2004 TC<sub>10</sub> and (2201). In MPEC 2004-T60.

McMillan, R. S., and J. V. Scotti. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 TD<sub>18</sub>. In MPEC 2004-T74.

McMillan, R. S., A. F. Tubbiolo, and A. S. Descour. 2004. Followup Observations of Asteroids 1998 BB<sub>10</sub>, 1998 JH<sub>2</sub>, 2001 QQ<sub>142</sub>, 2003 WY<sub>25</sub>, 2004 EH<sub>1</sub>, 2004 FA, 2004 FD, and (41429). In MPEC 2004-F48.



Megan, S. A., and M. Block. 2004. Discovery Observations of Small Apollo Asteroid 2004 BV<sub>18</sub>. In MPEC 2004-B23.

Montani, J. L., and A. E. Gleason. 2004. Preccovery of Asteroid 2004 EB and Incidental Followup of Asteroids 2000 FO<sub>10</sub> and 2004 FA<sub>18</sub>. In MPEC 2004-H89.

Read, M. T. 2004. Incidental Followup Observations of Asteroid 2004 DK<sub>1</sub>. In MPEC 2004-H15.

Read, M. T. 2004. Incidental Followup Observations of Asteroid (37336). In MPEC 2004-K74.

Read, M. T. 2004. Discovery Observations of Amor Asteroid 2004 RS<sub>25</sub>. In MPEC 2004-R50.

Read, M. T. 2004. Prediscovery Observations of Amor Asteroid 2004 SX. In MPEC 2004-S45.

Read, M. T. 2004. Incidental Observations of Periodic Comet 78P. In MPEC 2004-V04.

Read, M. T., and M. Block. 2004. Discovery and Followup Observations of Amor Asteroid 2004 RC<sub>252</sub>. In MPEC 2004-S03.

Read, M. T., T. H. Bressi, and M. Block. 2004. Recovery and Followup Observations of Potentially Hazardous Apollo Asteroid 1999 VT<sub>25</sub>. In MPEC 2004-U47.

Read, M. T., and J. A. Larsen. 2004. Independent Discovery Observations of Periodic Comet P/2004 EW<sub>38</sub> (Catalina-LINEAR). In MPEC 2004-G46.

Read, M. T., L. S. Garrett, and M. Block. 2004. Discovery and Followup Observations of Fast-Moving Small Amor Asteroid 2004 SA. In MPEC 2004-S11.

Read, M. T., J. A. Larsen, and M. Block. 2004. Incidental Followup Observations of Apollo Asteroid 2004 FE<sub>31</sub>. In MPEC 2004-H03.

Read, M. T., A. B. Marais, and T. H. Bressi. 2004. Discovery and Followup Observations of Small Amor Asteroid 2004 KG<sub>17</sub>. In MPEC 2004-K75.

Read, M. T., R. S. McMillan, and A. S. Descour. 2004. Discovery and Followup Observations of Small Apollo Asteroid 2004 VP. In MPEC 2004-V15.

Read, M. T., S. A. Megan, and T. H. Bressi. 2004. Discovery and Followup Observations of Small, Fast-moving Aten Asteroid 2004 UH<sub>1</sub>. In MPEC 2004-U29.

Read, M. T., A. M. Tuzzolino, and M. Block. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 XD<sub>6</sub>. In MPEC 2004-X33.

Scotti, J. V. 2004. Followup Observations of Asteroids 1999 BY<sub>9</sub> and 2001 XT<sub>1</sub>. In MPEC 2004-C01.

Scotti, J. V. 2004. Followup Observations of Asteroid 2004 AD<sub>1</sub>. In MPEC 2004-D03.

Scotti, J. V. 2004. Followup Observations of Asteroids 2000 EV<sub>70</sub>, 2000 RD<sub>34</sub>, 2002 JV<sub>15</sub>, 2003 QM<sub>47</sub>, 2003 UX<sub>5</sub>, 2003 VG<sub>1</sub>, 2003 YO<sub>1</sub>, 2003 YQ<sub>94</sub>, and 12923. In MPEC 2004-F25.

Scotti, J. V. 2004. Recovery of Large Amor Asteroid 2001 MA<sub>8</sub>. In MPEC 2004-F28.

Scotti, J. V. 2004. Recovery of Amor Asteroid 2001 BZ<sub>39</sub>. In MPEC 2004-F77.

Scotti, J. V. 2004. Followup Observations of Asteroids 2004 EN<sub>20</sub>, 2004 FJ<sub>29</sub>, 2004 GB<sub>2</sub>, and 2004 GE<sub>2</sub>. In MPEC 2004-G42.

Scotti, J. V. 2004. Incidental Followup Observations of Asteroids 2003 JC<sub>13</sub>, 2004 FA<sub>18</sub>, and (5626). In MPEC 2004-H72.

Scotti, J. V. 2004. Incidental Followup Observations of Periodic Comet P/2004 HC<sub>18</sub> (LINEAR). In MPEC 2004-H90.

Scotti, J. V. 2004. Incidental Followup Observations of Asteroid 1991 RJ<sub>2</sub>. In MPEC 2004-K02.

Scotti, J. V. 2004. Incidental Prediscovery Observations of Asteroid 2004 QU<sub>24</sub>. In MPEC 2004-R26.

Scotti, J. V. 2004. Followup Observations of Amor Asteroid 2004 RQ<sub>109</sub>. In MPEC 2004-R59.  
 Scotti, J. V. 2004. Discovery and Followup Observations of Large Asteroid 2004 RR<sub>109</sub> of Unusual Orbit. In MPEC 2004-R60.  
 Scotti, J. V. 2004. Recovery Observations of Apollo Asteroid 2003 KN<sub>18</sub>. In MPEC 2004-R66.  
 Scotti, J. V. 2004. Incidental Observations of Periodic Comet 56P/Slaughter-Burnham. In MPEC 2004-R72.  
 Scotti, J. V. 2004. Recovery Observations of Small Apollo Asteroid 2003 UO<sub>25</sub>. In MPEC 2004-T64.  
 Scotti, J. V. 2004. Followup Observations of Asteroids 2004 RQ<sub>10</sub>, 2004 TK<sub>10</sub>, 2004 TT<sub>12</sub>, and 2004 TD<sub>18</sub>. In MPEC 2004-U01.  
 Scotti, J. V. 2004. Followup Observations of Asteroids 2003 WP<sub>25</sub>, 2004 GD<sub>28</sub>, 2004 HK<sub>33</sub>, 2004 RQ<sub>10</sub>, 2004 RS<sub>25</sub>, 2004 TE<sub>18</sub>, and 2004 VY<sub>14</sub>. In MPEC 2004-W11.  
 Scotti, J. V. 2004. Followup Observations of Asteroids 1999 VT<sub>25</sub>, 2003 WP<sub>25</sub>, and 2004 RX<sub>165</sub>. In MPEC 2004-X69.  
 Scotti, J. V. 2004. Followup Observations of Periodic Comets 129P and 131P. In MPEC 2004-Y19.  
 Scotti, J. V., and M. Block. 2004. Discovery and Followup Observations of Amor Asteroid 2004 BS<sub>102</sub>. In MPEC 2004-C02.  
 Scotti, J. V., and M. Block. 2004. Discovery and Followup of Potentially Hazardous Asteroid 2004 BG<sub>121</sub>. In MPEC 2004-C38.  
 Scotti, J. V., and M. Block. 2004. Followup Observations of Asteroids 2002 AP<sub>3</sub>, 2002 SY<sub>50</sub>, 2004 HW, 2004 HO<sub>1</sub>, 2004 MX<sub>2</sub>, 2004 QE<sub>20</sub>, and 2004 XK<sub>3</sub>. In MPEC 2004-X32.  
 Scotti, J. V., and M. Block. 2004. Discovery and Followup of Apollo Asteroid 2004 XL<sub>29</sub>. In MPEC 2004-X56.  
 Scotti, J. V., and M. Block. 2004. Discovery and Followup of Small Apollo Asteroid 2004 XM<sub>29</sub>. In MPEC 2004-X57.  
 Scotti, J. V., and M. Block. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 XO<sub>29</sub>. In MPEC 2004-X59.  
 Scotti, J. V., and M. Block. 2004. Discovery and Followup Observations of Amor Asteroid 2004 XJ<sub>35</sub>. In MPEC 2004-X67.  
 Scotti, J. V., R. G. Gagliano, A. S. Descour. 2004. Discovery and Followup of Small, Fast-Moving Amor Asteroid 2004 HC<sub>33</sub>. In MPEC 2004-H60.  
 Scotti, J. V., and A. E. Gleason. 2004. Followup Observations of Asteroids 1996 DH, 2004 BL<sub>11</sub>, 2004 BV<sub>18</sub>, and 2004 CA<sub>2</sub>. In MPEC 2004-D10.  
 Scotti, J. V., Gleason, A. E., and M. Block. 2004. Discovery and Followup of Small Amor Asteroid 2004 JU<sub>20</sub>. In MPEC 2004-K03.  
 Scotti, J. V., and J. J. Gomez. 2004. Discovery and Followup Observations of Small, Fast-moving Apollo Asteroid 2004 XP<sub>35</sub>. In MPEC 2004-X68.  
 Scotti, J. V., J. A. Larsen, A. S. Descour, and A. E. Gleason. 2004. Preccovery of Potentially Hazardous Apollo Asteroid 2003 YK<sub>118</sub> in incidental astrometry resulting from reprocessing of image data archive. In MPEC 2004-C33.  
 Scotti, J. V., and J. A. Larsen. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 FE<sub>31</sub>. In MPEC 2004-F93.

- Scotti, J. V., and J. A. Larsen. 2004. Followup Observations of Asteroids 2000 EZ<sub>148</sub>, 2004 FU<sub>4</sub>, 2004 FZ<sub>5</sub>, and 2004 FC<sub>18</sub>. In MPEC 2004-F94.
- Scotti, J. V., and J. A. Larsen. 2004. Followup Observations of Comets P/2001 YX<sub>127</sub> and P/2004 EW<sub>38</sub>. In MPEC 2004-K43.
- Scotti, J. V., F. Mallia, A. E. Gleason, M. Block. 2004. Discovery and Followup Observations of Small Apollo FMO 2004 JP<sub>12</sub>. In MPEC 2004-J67.
- Scotti, J. V., R. S. McMillan, and A. S. Descour. 2004. Discovery and Followup Observations of Amor Asteroid 2004 FD<sub>4</sub>. In MPEC 2004-F44.
- Scotti, J. V., and R. S. McMillan. 2004. Followup Observations of Asteroids 1999 TZ<sub>4</sub>, 2003 JC<sub>13</sub>, 2004 EW, and 2004 FU<sub>4</sub>. In MPEC 2004-G26.
- Scotti, J. V., R. S. McMillan, and T. H. Bressi. 2004. Discovery and Followup Observations of Small Apollo Asteroid 2004 HR<sub>56</sub>. In MPEC 2004-H82.
- Scotti, J. V., R. S. McMillan, and T. H. Bressi. 2004. Discovery and Followup Observations of Outer Solar System Object 2004 HV<sub>60</sub>. In MPEC 2004-H91.
- Scotti, J. V., and R. S. McMillan. 2004. Followup Observations of Asteroids 1999 LD<sub>30</sub>, 2000 RL<sub>77</sub>, 2004 QB<sub>17</sub>, 2004 TN, (2201), (2212), (16816), and (54690). In MPEC 2004-T43.
- Scotti, J. V., and R. S. McMillan. Followup Observations of Asteroids 2004 HW, 2004 RK<sub>9</sub>, 2004 RW<sub>10</sub>, and 2004 RD<sub>84</sub>. In MPEC 2004-T63.
- Scotti, J. V., and R. S. McMillan. 2004. Followup Observations of Asteroids 1999 GT<sub>6</sub>, 2004 RK<sub>9</sub>, 2004 RW<sub>10</sub>, 2004 RD<sub>84</sub>, 2004 TN, 2004 TE<sub>8</sub>, 2004 TG<sub>10</sub>, and (2212). In MPEC 2004-T68.
- Scotti, J. V., and R. S. McMillan. 2004. Followup Observations of Asteroids 2002 PZ<sub>39</sub>, 2004 TN, 2004 TN<sub>1</sub>, 2004 TE<sub>8</sub>, 2004 TG<sub>10</sub>, 2004 TU<sub>11</sub>, and (54690). In MPEC 2004-T71.
- Scotti, J. V., and R. S. McMillan. 2004. Followup Observations of Comets C/2001 HT<sub>50</sub>, C/2002 V<sub>2</sub>, 56P, 78P, 88P, and 143P. In MPEC 2004-U17.
- Scotti, J. V., and M. T. Read. 2004. Incidental Precovery Observations of Asteroid 2004 PE<sub>20</sub> and Incidental Followup Observations of 2004 VZ<sub>14</sub>. In MPEC 2004-X22.
- Scotti, J. V., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2001 FD<sub>90</sub>, 2002 JV<sub>15</sub>, 2003 JC<sub>13</sub>, 2004 BV<sub>102</sub>, 2004 FJ<sub>11</sub>, 2004 FU<sub>64</sub>, and (5626). In MPEC 2004-G30.
- Scotti, J. V., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2002 TR<sub>69</sub>, 2004 RF<sub>84</sub>, 2004 RS<sub>109</sub>, 2004 RX<sub>10</sub>, and (20236). In MPEC 2004-R77.
- Scotti, J. V., and A. F. Tubbiolo. 2004. Followup Observations of Asteroids 2004 PM<sub>2</sub>, 2004 VD<sub>17</sub>, 2004 XK<sub>3</sub>, 2004 XJ<sub>35</sub>, and 2004 XP<sub>35</sub>. In MPEC 2004-X79.
- Scotti, J. V., and L. E. Turner. 2004. Discovery Observations of Small Amor Asteroid (FMO) 2004 JO<sub>12</sub>. In MPEC 2004-J64.
- Tubbiolo, A. F. 2004. Followup Observations of Asteroid (18109). In MPEC 2004-B57.
- Tubbiolo, A. F. 2004. Followup Observations of Comet C/2004 C<sub>1</sub> (Larsen). In MPEC 2004-F35.
- Tubbiolo, A. F. 2004. Prediscovery Observations of Potentially Hazardous Apollo Asteroid 2004 FJ<sub>11</sub>. In MPEC 2004-F63.
- Tubbiolo, A. F. 2004. Incidental Followup Observations of Asteroids 2002 GH<sub>1</sub> and (89136). In MPEC 2004-R58.
- Tubbiolo, A. F. 2004. Discovery Observations of Apollo Asteroid 2004 RW<sub>164</sub>. In MPEC 2004-R81.

Tubbiolo, A. F. 2004. Discovery Observations of Apollo Asteroid 2004 TN. In MPEC 2004-T14.

Tubbiolo, A. F. 2004. Followup Observations of Asteroids (8014) and (19764). In MPEC 2004-Y01.

Tubbiolo, A. F., M. Block, and J. V. Scotti. 2004. Prediscovery Observations of Potentially Hazardous Apollo Asteroid 2003 UX<sub>34</sub>. In MPEC 2004-L03.

Tubbiolo, A. F., and R. H. Broad. 2004. Incidental Followup Observations of Asteroids 2003 YG<sub>118</sub>, 2004 RE<sub>84</sub>, and 2004 RS<sub>109</sub>. In MPEC 2004-R67.

Tubbiolo, A. F., A. S. Descour, A. E. Gleason. 2004. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2004 JN<sub>2</sub>. In MPEC 2004-J54.

Tubbiolo, A. F., and A. S. Descour. 2004. Discovery and Followup Observations of Amor Asteroid 2004 KZ<sub>14</sub>. In MPEC 2004-K51.

Tubbiolo, A. F., A. S. Descour, and M. Block. 2004. Discovery and Followup Observations of Apollo Asteroid 2004 TE<sub>8</sub>. In MPEC 2004-T23.

Tubbiolo, A. F., A. E. Gleason, and M. Block. 2004. Prediscovery, Independent Rediscovery, and Followup Observations of Outer Solar System Object 2004 AE<sub>9</sub> (= SW40AS). In MPEC 2004-B11.

Tubbiolo, A. F., and J. A. Larsen. 2004. Discovery and Followup Observations of Small Apollo Asteroid 2004 BA<sub>75</sub>. In MPEC 2004-B64.

Tubbiolo, A. F., and R. S. McMillan. 2004. Followup Observations of Asteroids 1994 AB<sub>1</sub>, 1994 CN<sub>2</sub>, 2000 PD<sub>3</sub>, and 2004 FA. In MPEC 2004-F41.

Tubbiolo, A. F., and R. S. McMillan. 2004. Followup Observations of Amor Asteroid 2004 FU<sub>64</sub>. In MPEC 2004-G25.

Tubbiolo, A. F., and J. V. Scotti. 2004. Followup Observations of Asteroids 2000 EZ<sub>148</sub>, 2001 XT<sub>1</sub>, 2003 SU<sub>214</sub>, 2004 CS, 2004 EH<sub>1</sub>, 2004 FD, (08567), (12923), and (18109). In MPEC 2004-F30.

Tubbiolo, A. F., and J. V. Scotti. 2004. Discovery and Followup Observations of Small Apollo Asteroid 2004 XB<sub>45</sub>. In MPEC 2004-X71.

#### **MPECs, 2005 Jan. 1 - 2005 Nov 30:**

Block, M. 2005. Followup Observations of Virtual Impactor Apollo Asteroid 2004 VD<sub>17</sub>. In MPEC 2005-A58.

Block, M. 2005. Followup Observations of Asteroids 2000 DP<sub>107</sub>, 2004 MX<sub>2</sub>, and 2005 AU<sub>3</sub>. In MPEC 2005-B02.

Block, M. 2005. Recovery Observations of Large Amor Asteroid 2002 QG<sub>24</sub>. In MPEC 2005-B30.

Block, M. 2005. Followup Observations of Potentially Hazardous, Virtual Impactor Apollo Asteroid 2005 EM<sub>30</sub> and Incidental Followup Observations of Asteroids 2000 OJ<sub>8</sub> and (18172). In MPEC 2005-E40.

Block, M. 2005. Followup Observations of Large, Potentially Hazardous Virtual Impactor Apollo Asteroid 2005 GE<sub>59</sub> and Incidental Followup Observations of Asteroid (89958). In MPEC 2005-H02.

Block, M. 2005. Incidental Followup Observations of Asteroid 2002 RS<sub>28</sub>. In MPEC 2005-H04.

Block, M. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 GM<sub>162</sub>. In MPEC 2005-H05.

Block, M. 2005. Followup Observations of Potentially Hazardous Virtual Impactor Apollo Asteroid 2005 GE<sub>59</sub>, and Incidental Followup of Asteroids 1998 MQ and 1999 HD<sub>1</sub>. In MPEC 2005-H08.

Block, M. 2005. Incidental Prediscovery Observations of Potentially Hazardous Apollo Asteroid 2005 JU<sub>1</sub>. In MPEC 2005-J18.

Block, M. 2005. Followup Observations of Asteroid 2005 GE<sub>59</sub>. In MPEC 2005-K17.

Block, M. 2005. Recovery Observations of Amor Asteroid 2002 PG<sub>43</sub>. In MPEC 2005-L13.

Block, M. 2005. Incidental Followup Observations of Amor Asteroid 2005 LV<sub>3</sub>. In MPEC 2005-L22.

Block, M. 2005. Followup Observations of Asteroid 2002 FQ<sub>4</sub>. In MPEC 2005-L43.

Block, M. 2005. Targeted Followup Observations of Periodic Comet 9P Tempel 1. In MPEC 2005-N55.

Block, M. 2005. Incidental Followup Observations of Periodic Comet P/2005 N3 (Larson). In MPEC 2005-O10.

Block, M. 2005. Incidental Followup Observations of Periodic Comet P/2005 N3 (Larson). In MPEC 2005-R15.

Block, M. 2005. Prediscovery Observations of Comet C/2005 S<sub>2</sub> (Skiff). In MPEC 2005-S78.

Block, M. 2005. Incidental Followup Observations of Periodic Comet P/2005 S3 (Read). In MPEC 2005-U07.

Block, M. 2005. Targeted Followup Observations of Asteroids 2003 YG<sub>118</sub>, 2005 GC<sub>141</sub>, 2005 NX<sub>44</sub>, 2005 OU<sub>1</sub>, 2005 SQ, and 2005 SS<sub>4</sub>. In MPEC 2005-U16.

Block, M. 2005. Recovery Observations of Amor Asteroid 2001 MR<sub>3</sub>. In MPEC 2005-U41.

Block, M. 2005. Targeted Followup Observations of Apollo Asteroid 2005 VA<sub>2</sub>. In MPEC 2005-V51.

Block, M. 2005. Targeted Followup Observations of Asteroids 2005 VC and 2005 VL<sub>1</sub>. In MPEC 2005-W20.

Block, M. 2005. Recovery Observations of Potentially Hazardous Apollo Asteroid 1998 VF<sub>32</sub>. In MPEC 2005-W43.

Block, M., and T. H. Bressi. 2005. Recovery Observations of Apollo Asteroid 2001 KO<sub>2</sub>. In MPEC 2005-B32.

Block, M., T. H. Bressi, and J. V. Scotti. 2005. Observations of Periodic Comet P/2005 GF<sub>8</sub>. In MPEC 2005-G88.

Block, M., and T. H. Bressi. Followup Observations of Asteroids 2001 HG<sub>31</sub>, 2003 KO<sub>2</sub>, 2005 GP<sub>21</sub>, and (13553). In MPEC 2005-J62.

Block, M., and T. H. Bressi. 2005. Followup Observations of Asteroids 1990 OS, 1998 HL<sub>49</sub>, 1998 SC<sub>15</sub>, 2002 SQ, 2003 MV<sub>7</sub>, 2005 GL<sub>1</sub>, 2005 JB<sub>22</sub>, and (4015). In MPEC 2005-J65.

Block, M., and T. H. Bressi. 2005. Followup Observations of Asteroids 1999 JE<sub>1</sub>, 1999 JA<sub>11</sub>, 2002 FG<sub>7</sub>, and 2003 KW<sub>16</sub>. In MPEC 2005-K02.

Block, M., and T. H. Bressi, 2005. Followup Observations of Asteroids 2001 TX<sub>1</sub> and (5626). In MPEC 2005-L11.

Block, M., and T. H. Bressi. 2005. Discovery and Followup Observations of Amor Asteroid 2005 SW<sub>4</sub>. In MPEC 2005-S54.

Block, M., and T. H. Bressi. 2005. Discovery and Followup Observations of Small Apollo Asteroid 2005 SQ<sub>9</sub>. In MPEC 2005-S66.

Block, M., and T. H. Bressi. 2005. Discovery and Followup Observations of Large Amor Asteroid 2005 SG<sub>19</sub>. In MPEC 2005-S71.

Block, M., and T. H. Bressi. 2005. Discovery and Followup Observations of Large Apollo Asteroid 2005 SH<sub>19</sub>. In MPEC 2005-S72.

Block, M., and T. H. Bressi. 2005. Discovery and Followup Observations of Apollo Asteroid 2005 TF<sub>50</sub>. In MPEC 2005-T83.

Block, M., and T. H. Bressi. 2005. Recovery Observations of Amor Asteroid 1998 KH<sub>9</sub>. In MPEC 2005-U43.

Block, M., and T. H. Bressi. 2005. Targeted Followup Observations of Amor Asteroid 2005 UC<sub>1</sub>. In MPEC 2005-U44.

Block, M., and T. H. Bressi. 2005. Targeted Followup Observations of Asteroids 2000 SB<sub>25</sub>, 2004 CH<sub>52</sub>, 2004 UL, 2005 NP<sub>1</sub>, 2005 QG<sub>88</sub>, 2005 RP<sub>6</sub>, 2005 SQ<sub>1</sub>, 2005 SP<sub>9</sub>, 2005 SQ<sub>9</sub>, 2005 SG<sub>19</sub>, 2005 SH<sub>19</sub>, 2005 SN<sub>25</sub>, 2005 SH<sub>26</sub>, 2005 SZ<sub>70</sub>, 2005 TN, 2005 TF<sub>50</sub>, and 2005 UG. In MPEC 2005-U42.

Block, M., A. S. Descour, M. T. Read, and A. F. Tubbiolo. 2005. Prediscovery Observations of Apollo Asteroid 2005 CL and Followup Observations of Asteroids (11054) and (16912). In MPEC 2005-E17.

Block, M., A. S. Descour, A. F. Tubbiolo, and R. S. McMillan. 2005. Prediscovery Observations of Potentially Hazardous Aten Asteroid 2005 AY<sub>28</sub> and Large Apollo Asteroid 2004 LA<sub>12</sub>, and Incidental Followup Observations of Asteroids 2000 OJ<sub>8</sub>, 2001 HG<sub>31</sub>, 2002 GT, and 2005 EA. In MPEC 2005-E62.

Block, M., A. S. Descour, and R. S. McMillan. 2005. Prediscovery Observations of Small Apollo Asteroid 2005 FG and Incidental Followup Observations of Apollo Asteroid 2003 XV<sub>10</sub>. In MPEC 2005-F23.

Block, M., and A. S. Descour. 2005. Followup Observations of Former Virtual Impactor Apollo Asteroid 2005 FC<sub>3</sub>, Incidental Observations of Large Potentially Hazardous Apollo Asteroid 2004 NL<sub>8</sub>, and Incidental Observations of Asteroid (16064). In MPEC 2005-G09.

Block, M., and A. S. Descour. 2005. Recovery Observations of Large, Potentially Hazardous Apollo Asteroid 1990 SM. In MPEC 2005-G48.

Block, M., and A. S. Descour. 2005. Recovery Observations of Potentially Hazardous Apollo Asteroid 2003 BH. In MPEC 2005-J56.

Block, M., and A. S. Descour. 2005. Targeted Followup Observations of Asteroids 1998 SO, 2000 FJ<sub>10</sub>, 2002 JQ<sub>9</sub>, 2004 QD<sub>14</sub>, 2005 FN<sub>4</sub>, and 2005 LZ<sub>42</sub>. In MPEC 2005-R45.

Block, M., and A. S. Descour. 2005. Discovery and Followup Observations of Amor Asteroid 2005 SR<sub>1</sub>. In MPEC 2005-S44.

Block, M., A. S. Descour, and T. H. Bressi. 2005. Discovery and Followup Observations of Amor Asteroid 2005 SX<sub>4</sub>. In MPEC 2005-S55.

Block, M., A. E. Gleason, and M. T. Read. 2005. Prediscovery Observations of Potentially Hazardous Apollo Asteroid 2004 MD and Amor Asteroid 2005 EC<sub>224</sub>. In MPEC 2005-F10.

Block, M., A. E. Gleason, and J. V. Scotti. 2005. Targeted Followup Observations of Asteroids 2004 LA<sub>12</sub>, 2005 NJ<sub>1</sub>, 2005 UO, 2005 UL<sub>6</sub>, 2005 VC, and 2005 VT<sub>2</sub>, and Incidental Followup Observations of Asteroid 2003 OV<sub>31</sub>. In MPEC 2005-W45.

Block, M., R. Gorelli, and T. H. Bressi. 2005. Rediscovery and Followup Observations of Small, Fast-Moving Aten Asteroid 2005 TH<sub>50</sub>. In MPEC 2005-T85.

Note: 2005 TH50 was initially discovered by T. H. Bressi, and X. J. Zhang but was lost and rediscovered by the above.

Block, M., and E. P. Majden. 2005. Discovery and Followup Observations of Potentially Hazardous, Fast-moving Apollo Asteroid 2005 NX<sub>55</sub>. In MPEC 2005-N64.

Block, M., and R. S. McMillan. 2005. Recovery Observations of Potentially Hazardous Apollo Asteroid 2002 TW<sub>55</sub>. In MPEC 2005-E54.

Block, M., and R. S. McMillan. 2005. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2005 EG<sub>94</sub>. In MPEC 2005-E58.

Block, M., R. S. McMillan, J. V. Scotti, and A. F. Tubbiolo. 2005. Prediscovery Observations of Apollo Asteroid 2005 AN<sub>26</sub> and Potentially Hazardous Apollo Asteroid 2005 BY<sub>2</sub>. In MPEC 2005-E85.

Block, M., R. S. McMillan, M. T. Read, and A. F. Tubbiolo. 2005. Prediscovery Observations of Potentially Hazardous Asteroids 2004 OB, 2004 RW<sub>10</sub>, & 2005 EE. In MPEC 2005-F01.

Block, M., and R. S. McMillan. 2005. Discovery and Followup Observations of Large Amor Asteroid 2005 JA<sub>22</sub>. In MPEC 2005-J36.

Block, M., and M. T. Read. 2005. Followup Observations of Small Virtual Impactor Apollo Asteroid 2005 BS<sub>1</sub>. In MPEC 2005-D27.

Block, M., M. T. Read, and A. S. Descour. 2005. Followup Observations of Asteroids 2000 EH<sub>26</sub> and 2002 GF<sub>1</sub>. In MPEC 2005-J55.

Block, M., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 2001 BZ<sub>39</sub>, 2001 XV<sub>266</sub>, and 2005 JA<sub>22</sub>. In MPEC 2005-N66.

Block, M., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 1994 UG, 2005 OX<sub>1</sub>, 2005 PO, 2005 QG<sub>30</sub>, 2005 SR<sub>1</sub>, 2005 SR<sub>4</sub>, 2005 SV<sub>4</sub>, 2005 SQ<sub>9</sub>, 2005 TL, 2005 TF<sub>45</sub>, and 2005 TF<sub>50</sub>, and Incidental Followup Observations of Asteroid 1998 MZ. In MPEC 2005-U02.

Block, M., and M. T. Read. 2005. Observations of Comets P/2005 S2, 65P, 171P, and 172P. In MPEC 2005-U66.

Block, M., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 1994 UG, 1995 SA, 1999 CF<sub>9</sub>, 2005 PY<sub>16</sub>, 2005 UK<sub>1</sub>, 2005 UU<sub>3</sub>, 2005 UF<sub>5</sub>, 2005 UM<sub>5</sub>, 2005 UL<sub>6</sub>, and 2005 VC, and Incidental Followup Observations of Asteroids 1999 YB and (7358). In MPEC 2005-V53.

Block, M., and M. T. Read. 2005. Targeted Followup Observations of Asteroid 2005 UK<sub>5</sub> and Incidental Followup Observations of Asteroid 2005 UK. In MPEC 2005-V57.

Block, M., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 1994 UG, 2002 UK<sub>11</sub>, 2005 SN<sub>25</sub>, 2005 UH, 2005 UY<sub>5</sub>, 2005 UH<sub>6</sub>, 2005 UL<sub>6</sub>, 2005 UQ<sub>64</sub>, and 2005 VR, and Incidental Followup Observations of Asteroids 2005 UK and 2005 UY<sub>5</sub>. In MPEC 2005-W33.

Block, M., M. T. Read, R. S. McMillan, and A. S. Descour. 2005. Prediscovery, Discovery, and Incidental Followup Observations of Centaur/Scattered-Disk Object 2005 UJ<sub>438</sub>. In MPEC 2005-W42.

Block, M., and J. V. Scotti. 2005. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2005 CJ. In MPEC 2005-C15.

Block, M., and J. V. Scotti. 2005. Prediscovery Observations of Large, Potentially Hazardous Apollo Asteroid 2003 KU<sub>2</sub> and Potentially Hazardous Amor Asteroid 2003 MU, and Observations of satellites J008S, J009S, J010S, and J018S of Jupiter. In MPEC 2005-F26.

Block, M., J. V. Scotti, and T. H. Bressi. 2005. Followup Observations of Potentially Hazardous Virtual Impactor Apollo Asteroid 2005 GE<sub>59</sub> and Apollo Asteroid 2005 GD<sub>60</sub>. In MPEC 2005-G75.

Block, M., and J. V. Scotti. 2005. Followup Observations of Asteroids 1999 NB<sub>5</sub>, 2004 BE<sub>68</sub>, 2005 EQ<sub>70</sub>, 2005 EA<sub>94</sub>, 2005 JA<sub>22</sub>, 2005 JE<sub>46</sub>, (7350), and (11311). In MPEC 2005-L14.

Block, M., and J. V. Scotti. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 LO<sub>3</sub>. In MPEC 2005-L16.

Block, M., J. V. Scotti, and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2000 VJ<sub>61</sub>, 2001 KO<sub>20</sub>, 2002 AC<sub>3</sub>, and 2003 MV<sub>7</sub>, and Incidental Followup Observations of Asteroid 2004 YR. In MPEC 2005-N25.

Block, M., and J. V. Scotti. 2005. Targeted Followup Observations of Asteroids 2000 MU<sub>1</sub>, 2001 OD<sub>3</sub>, and 2003 CC, and Incidental Followup Observations of Asteroids (3352) and (13553). In MPEC 2005-N30.

Block, M., and J. V. Scotti. 2005. Targeted Followup Observations of Asteroids 2000 QN<sub>130</sub> and 2000 RJ<sub>60</sub>, and Incidental Followup of Asteroids 1999 NB<sub>5</sub>, 2002 RMC<sub>9</sub>, and 2005 MP<sub>13</sub>. In MPEC 2005-N36.

Block, M., and J. V. Scotti. 2005. Targeted Followup Observations of Asteroid 2005 MR<sub>5</sub>, and Incidental Followup Observations of Asteroids 1996 XB<sub>27</sub>, 2002 QY<sub>6</sub>, and (17182). In MPEC 2005-R12.

Block, M., and J. V. Scotti. 2005. Discovery and Followup Observations of Centaur or Scattered-Disk Object 2005 WY<sub>3</sub>. In MPEC 2005-W71.

Block, M., and A. F. Tubbiolo. 2005. Recovery Observations of Large, Distant Amor Asteroid 2003 UD<sub>8</sub>. In MPEC 2005-B11.

Block, M., A. F. Tubbiolo, and A. E. Gleason. 2005. Prediscovery Observations of Potentially Hazardous Apollo Asteroid 2004 PJ<sub>2</sub>. In MPEC 2005-E91.

Block, M., and A. F. Tubbiolo. 2005. Followup Observations of Comets 2P and 101P. In MPEC 2005-Q40.

Bressi, T. H. 2005. Followup Observations of Small Apollo Asteroid 2005 BS<sub>1</sub>. In MPEC 2005-B20.

Bressi, T. H. 2005. Recovery Observations of Apollo Asteroid 2003 CY<sub>18</sub>. In MPEC 2005-B35.

Bressi, T. H. 2005. Recovery Observations of Aten Asteroid 2004 DH<sub>2</sub>. In MPEC 2005-C56.

Bressi, T. H. 2005. Incidental Followup Observations of Asteroid 2001 WR<sub>1</sub>. In MPEC 2005-G71.

Bressi, T. H. 2005. Incidental Followup Observations of Asteroid (88254). In MPEC 2005-G84.

Bressi, T. H. 2005. Recovery Observations of Apollo Asteroid 1999 HD<sub>1</sub>. In MPEC 2005-G89.

Bressi, T. H. 2005. Incidental Followup Observations of Potentially Hazardous and Virtual Impactor Apollo Asteroid 2005 GE<sub>59</sub>. In MPEC 2005-G92.



Bressi, T. H. 2005. Followup Observations of Asteroids 2002 FV<sub>5</sub> and 2004 MN<sub>4</sub>. In MPEC 2005-L01.

Bressi, T. H. 2005. Targeted Followup Observations of Large Mars Crosser Asteroid 2005 NA<sub>56</sub>. In MPEC 2005-N78.

Bressi, T. H. 2005. Discovery and Followup Observations of Amor Asteroid 2005 SR<sub>9</sub>. In MPEC 2005-S67.

Bressi, T. H. 2005. Targeted Followup Observations of Asteroid 2000 FJ<sub>10</sub>. In MPEC 2005-S74.

Bressi, T. H. 2005. Followup Observations of Comet C/2005 R<sub>4</sub> (LINEAR). In MPEC 2005-T01.

Bressi, T. H. 2005. Followup Observations of Periodic Comet P/2005 T2 (Christensen). In MPEC 2005-T66.

Bressi, T. H. 2005. Targeted Followup Observations of Asteroids 2001 RQ<sub>3</sub>, 2005 SQ<sub>1</sub>, 2005 TR<sub>15</sub>, and 2005 TE<sub>49</sub>. In MPEC 2005-T81.

Bressi, T. H. 2005. Targeted Followup Observations of Amor Asteroid 2005 UD<sub>1</sub>. In MPEC 2005-U45.

Bressi, T. H. 2005. Targeted Followup Observations of Potentially Hazardous Apollo Asteroid 2005 UH<sub>1</sub>. In MPEC 2005-U49.

Bressi, T. H. 2005. Targeted Followup Observations of Large, Potentially Hazardous Apollo Asteroid 2005 UK<sub>1</sub>. In MPEC 2005-U51.

Bressi, T. H. 2005. Discovery and Followup Observations of Small, Fast-moving Apollo Asteroid 2005 UG<sub>3</sub>. In MPEC 2005-U58.

Bressi, T. H., M. Block, and A. S. Descour. 2005. Followup Observations of Asteroids 1999 NB<sub>5</sub> and 2002 GF<sub>1</sub>. In MPEC 2005-L34.

Bressi, T. H., and M. Block. 2005. Targeted Followup Observations of Asteroids 1998 XR<sub>16</sub>, 2003 RN<sub>10</sub>, 2005 PY<sub>16</sub>, 2005 QZ<sub>151</sub>, 2005 SQ, and 2005 SP<sub>1</sub>, and Incidental Followup Observations of Asteroids 2003 EF<sub>54</sub>, (11284), and (54401). In MPEC 2005-T65.

Bressi, T. H., and M. Block. 2005. Incidental Followup Observations of Asteroids 2005 SW<sub>4</sub> and 2005 SH<sub>19</sub>. In MPEC 2005-U01.

Bressi, T. H., and A. S. Descour. 2005. Followup Observations of Asteroids 2000 DK<sub>79</sub>, 2002 AV<sub>31</sub>, 2003 NO<sub>4</sub>, 2004 CE<sub>39</sub>, 2005 AV<sub>3</sub>, 2005 BC, and 2005 BE<sub>2</sub>. In MPEC 2005-B33.

Bressi, T. H., A. S. Descour, M. T. Read, and J. V. Scotti. 2005. Targeted Recovery Observations of Asteroid 1990 HA, Targeted Followup Observations of Asteroids 1998 SO, 2002 SM, and Incidental Followup Observations of Asteroids 1998 FX<sub>134</sub> and 2002 QY<sub>6</sub>. In MPEC 2005-R01.

Bressi, T. H., and A. S. Descour. 2005. Targeted Followup Observations of Asteroids 2000 EV<sub>106</sub>, 2002 AF<sub>3</sub>, 2002 EA<sub>3</sub>, 2002 GM<sub>9</sub>, 2003 SG<sub>170</sub>, and Incidental Followup Observations of Asteroids 1998 FX<sub>134</sub>, 2000 WN<sub>107</sub>, 2002 QY<sub>6</sub>, and 2005 OF<sub>3</sub>. In MPEC 2005-R55.

Bressi, T. H., and A. S. Descour. 2005. Targeted Followup Observations of Asteroids 2000 OB<sub>22</sub>, 2002 XU<sub>4</sub>, 2005 SP<sub>1</sub>, 2005 SR<sub>1</sub>, 2005 SS<sub>4</sub>, 2005 SQ<sub>9</sub>, 2005 SG<sub>19</sub>, 2005 TD<sub>49</sub>, 2005 TF<sub>49</sub>, 2005 TF<sub>50</sub>, 2005 TH<sub>50</sub>, and 2005 TV<sub>51</sub>. In MPEC 2005-T93.

Bressi, T. H., and A. S. Descour. 2005. Incidental Followup Observations of Asteroids 1996 XB<sub>27</sub> and (90373). In MPEC 2005-T101.

Bressi, T. H., R. Dymock, T. Gehrels, and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 UH<sub>5</sub>. In MPEC 2005-U77.

Bressi, T. H., T. Gehrels, and J. V. Scotti. 2005. Discovery and Followup Observations of Small Apollo Asteroid 2005 UG<sub>5</sub>. In MPEC 2005-U76.

Bressi, T. H., J. J. Gomez, M. Block. 2005. Discovery and Followup Observations of Small, Fast, Closely-approaching Apollo Asteroid 2005 TK<sub>50</sub>. In MPEC 2005-T87.

Bressi, T. H., E. Guido, and T. Gehrels. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 UW<sub>3</sub>. In MPEC 2005-U70.

Bressi, T. H., R. S. McMillan, and A. F. Tubbiolo. 2005. Prediscovery Observations of Periodic Comet P/2004 L4 (Christensen). In MPEC 2005-L65.

Bressi, T. H., and M. T. Read. 2005. Followup Observations of Asteroids 1978 CA, 2000 WO<sub>67</sub>, 2003 MA<sub>3</sub>, 2004 EP<sub>20</sub>, 2004 XL<sub>29</sub>, 2005 AY<sub>28</sub>, 2005 BO<sub>1</sub>, 2005 BY<sub>1</sub>, (6569), (34613), and (40267). In MPEC 2005-B28.

Bressi, T. H., and M. T. Read. 2005. Followup Observations of Asteroids 1999 VO<sub>6</sub>, 2001 XV<sub>4</sub>, 2002 RV<sub>112</sub>, 2004 FN<sub>18</sub>, 2004 MD<sub>6</sub>, 2004 UV<sub>1</sub>, and 2005 JT<sub>81</sub>. In MPEC 2005-L04.

Bressi, T. H., M. T. Read, and M. Block. 2005. Targeted Followup Observations of Asteroids 2005 LX<sub>36</sub>, 2005 LW<sub>39</sub>, 2005 LZ<sub>42</sub>, and 2005 MR<sub>1</sub>, and Incidental Followup Observations of Asteroid 2001 TX<sub>1</sub>. In MPEC 2005-O01.

Bressi, T. H., and M. T. Read. 2005. Targeted Followup Observations of Asteroid 2005 MP<sub>13</sub> and Incidental Followup Observations of Asteroids 1999 JA<sub>11</sub> and (3352). In MPEC 2005-O02.

Bressi, T. H., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 2000 YF<sub>29</sub> and 2005 GQ<sub>21</sub>, and Incidental Followup Observations of Asteroids 2000 WK<sub>63</sub> and (88188). In MPEC 2005-Q52.

Bressi, T. H., M. T. Read and D. Ye. 2005. Targeted Followup Observations of Asteroids 1996 XB<sub>27</sub>, 2000 FJ<sub>10</sub>, 2000 MU<sub>1</sub>, 2001 FX<sub>9</sub>, 2001 MA<sub>8</sub>, 2002 VP<sub>69</sub>, 2004 CH<sub>52</sub>, 2004 WS<sub>2</sub>, 2005 EJ<sub>225</sub>, and 2005 MR<sub>1</sub>, and Incidental Followup Observations of Asteroid 2005 QP<sub>11</sub>. In MPEC 2005-Q56.

Bressi, T. H., M. T. Read and M. Trojanowsk. 2005. Targeted Followup Observations of Asteroids 2002 TB<sub>58</sub>, 2003 HS<sub>42</sub>, 2005 QQ<sub>11</sub>, and 2005 QP<sub>87</sub>, and Incidental Followup Observations of Asteroids 2000 WK<sub>63</sub> and 2005 RJ<sub>3</sub>. In MPEC 2005-R57.

Bressi, T. H., and M. T. Read. 2005. Incidental Followup Observations of Comets 2P and 101P. In MPEC 2005-S21.

Bressi, T. H., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 2002 XZ<sub>38</sub>, 2005 QG<sub>30</sub>, 2005 QG<sub>88</sub>, and 2005 SR<sub>1</sub>, and Incidental Followup Observations of Asteroids 2002 EZ<sub>2</sub> and 2005 SQ. In MPEC 2005-S69.

Bressi, T. H., and J. V. Scotti. 2005. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2005 UM<sub>5</sub>. In MPEC 2005-U80.

Bressi, T. H., and J. V. Scotti. 2005. Targeted Followup Observations of Asteroids 2002 BY and 2005 UG<sub>5</sub>, and Incidental Followup Observations of Asteroid 2002 BY. In MPEC 2005-U98.

Bressi, T. H., and A. F. Tubbiolo. 2005. Followup Observations of Asteroids 2000 YV<sub>137</sub>, 2005 GC<sub>141</sub>, 2005 HM<sub>3</sub>, 2005 NB<sub>7</sub>, 2005 NE<sub>21</sub>, and (31210). In MPEC 2005-Q41.

Bressi, T. H., X. J. Zhang and A. S. Descour. 2005. Discovery of 2005 TH<sub>50</sub> and Targeted Followup Observations of Asteroids 2002 UK<sub>11</sub>, 2002 VP<sub>69</sub>, 2004 TK<sub>10</sub>, 2005 PP, 2005 SE<sub>71</sub>, 2005 TN, 2005 TB<sub>15</sub>, 2005 TS<sub>15</sub>, and 2005 TF<sub>45</sub>, and Incidental Followup Observations of Asteroids 1998 MZ, (3361), (8176), and (66251). In MPEC 2005-T90.

Descour, A. S. 2005. Followup Observations of Potentially Hazardous and Former Virtual Impactor Apollo Asteroid 2005 EJ<sub>225</sub> and Incidental Followup Observations of Amor Asteroid 2002 FW<sub>5</sub>. In MPEC 2005-G01.

Descour, A. S. 2005. Followup Observations of Amor Asteroid 2002 GF<sub>1</sub>. In MPEC 2005-G02.

Descour, A. S. 2005. Incidental Followup Observations of Comet 105P. In MPEC 2005-G26.

Descour, A. S. 2005. Followup Observations of Potentially Hazardous Apollo Asteroid 2005 GE<sub>59</sub> and Asteroid (719). In MPEC 2005-H10.

Descour, A. S. 2005. Followup Observations of Large Apollo Asteroid 1998 HL<sub>49</sub>. In MPEC 2005-J04.

Descour, A. S. 2005. Followup Observations of Comet C/2004 PY<sub>42</sub> (CINEOS). In MPEC 2005-M12.

Descour, A. S. 2005. Targeted Followup Observations of Asteroids 2000 PK<sub>5</sub>, 2001 WL<sub>15</sub>, 2002 PG<sub>80</sub>, 2003 QW<sub>30</sub>, and 2005 LO<sub>3</sub>. In MPEC 2005-M16.

Descour, A. S. 2005. Targeted Followup Observations of Asteroids 2000 JG<sub>5</sub>, 2005 GN<sub>59</sub>, 2005 LQ<sub>40</sub>, and 2005 LZ<sub>42</sub>. In MPEC 2005-M58.

Descour, A. S. 2005. Followup Observations of Apollo Asteroid 2005 NL<sub>1</sub>. In MPEC 2005-Q33.

Descour, A. S. 2005. Targeted Followup Observations of Potentially Hazardous Apollo Asteroid 2005 SQ. In MPEC 2005-S33.

Descour, A. S. 2005. Discovery Observations of Amor Asteroid 2005 VM<sub>1</sub>. In MPEC 2005-V47.

Descour, A. S. 2005. Incidental Followup Observations of Asteroids 2005 UE and 2005 UH. In MPEC 2005-V34.

Descour, A. S. 2005. Incidental Followup Observations of Asteroid 2001 XE<sub>1</sub>. In MPEC 2005-V42.

Descour, A. S. 2005. Incidental Observations of Periodic Comet 65P. In MPEC 2005-V69.

Descour, A. S. 2005. Incidental Followup Observations of Periodic Comet P/2005 U1 (Read). In MPEC 2005-V71.

Descour, A. S. 2005. Targeted Followup Observations of Amor Asteroid 2005 VS<sub>5</sub>. In MPEC 2005-V75.

Descour, A. S., and M. Block. 2005. Targeted Followup Observations of Asteroids 1994 CJ<sub>1</sub>, 2001 GN<sub>2</sub>, 2005 MR<sub>1</sub>, 2005 MR<sub>5</sub>, 2005 OU<sub>1</sub>, 2005 PO, 2005 PP, 2005 QQ<sub>11</sub>, and 2005 QP<sub>87</sub>, and Incidental Followup of Asteroids 2005 QF<sub>88</sub> and (17182). In MPEC 2005-S35.

Descour, A. S., and M. Block. 2005. Targeted Followup Observations of Asteroids 1998 FN<sub>9</sub>, 1998 SO, 1999 RH<sub>33</sub>, and 2000 JB<sub>6</sub>, and Incidental Followup Observations of Asteroids 2002 BY and (3361). In MPEC 2005-S39.

Descour, A. S., M. E. Boschat, and T. H. Bressi. 2005. Discovery and Followup Observations of Small, Fast-Moving Apollo Asteroid 2005 TV<sub>51</sub>. In MPEC 2005-T92.

Descour, A. S., Bressi, T. H., and M. Block. 2005. Targeted Followup Observations of Asteroids 1998 FN<sub>9</sub>, 1999 BJ<sub>8</sub>, 2005 QG<sub>30</sub>, and 2005 SQ, and Incidental Followup Observations of Asteroids 2000 WN<sub>107</sub> and (66251). In MPEC 2005-S48.

Descour, A. S., and T. H. Bressi. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 SR<sub>4</sub>. In MPEC 2005-S50.

Descour, A. S., T. H. Bressi, and M. Block. 2005. Targeted Followup Observations of Asteroids 2001 JM<sub>1</sub>, 2004 TK<sub>10</sub>, 2004 UL, 2005 EY, and 2005 QG<sub>88</sub>, and Incidental Followup Observations of Asteroids 2005 NY<sub>39</sub> and 2005 QX<sub>151</sub>. In MPEC 2005-S64.

Descour, A. S., T. H. Bressi, and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2000 SD<sub>8</sub>, 2005 UG, 2005 UH, 2005 UK, 2005 UU<sub>3</sub>, 2005 UF<sub>5</sub>, 2005 UL<sub>5</sub>, 2005 UM<sub>5</sub>, 2005 UY<sub>5</sub>, 2005 UL<sub>6</sub>, 2005 UU<sub>6</sub>, 2005 UW<sub>6</sub>, 2005 UW<sub>64</sub>, 2005 UP<sub>156</sub>, 2005 UJ<sub>159</sub>, 2005 VH<sub>1</sub>, 2005 VL<sub>1</sub>, 2005 VM<sub>1</sub>, 2005 VT<sub>2</sub>, 2005 VY<sub>3</sub>, and Incidental Observations of Asteroids 2005 OW, 2005 UA<sub>6</sub>, and (90075). In MPEC 2005-V72.

Descour, A. S., T. Chen, and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 WO<sub>3</sub>. In MPEC 2005-W66.

Descour, A. S., P. J. Czuma, and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 WP<sub>3</sub>. In MPEC 2005-W67.

Descour, A. S., and R. C. Klein. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 FJ. In MPEC 2005-F21.

Descour, A. S., and R. S. McMillan. 2005. Followup Observations of Asteroids 2000 CT<sub>101</sub>, 2001 XQ<sub>30</sub>, and 2005 EZ<sub>29</sub>. In MPEC 2005-M64.

Descour, A. S., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 1999 NB<sub>5</sub>, 2003 AO<sub>4</sub>, and 2004 TB<sub>18</sub>, and Incidental Followup Observations of Asteroids 2005 AB, 2005 HA<sub>8</sub>, and (3352). In MPEC 2005-N06.

Descour, A. S., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2005 QQ<sub>11</sub>, 2005 UM<sub>5</sub>, and 2005 VL<sub>1</sub>, and Incidental Followup Observations of Asteroids 1999 VL<sub>12</sub> and 2005 UE. In MPEC 2005-V77.

Descour, A. S., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2002 VE<sub>68</sub>, 2003 WO<sub>151</sub>, 2004 XN<sub>14</sub>, 2005 TG<sub>50</sub>, 2005 UH<sub>6</sub>, 2005 UL<sub>6</sub>, and 2005 VL<sub>1</sub>, and Incidental Followup Observations of Asteroids 1996 DH, 1999 VL<sub>12</sub>, and 2001 XE<sub>1</sub>. In MPEC 2005-V79.

Descour, A. S., and M. T. Read. 2005. Followup Observations of Asteroids 2003 AA<sub>3</sub>, 2003 WB<sub>25</sub>, 2005 EZ<sub>29</sub>, (4341), and 18736). In MPEC 2005-M07.

Descour, A. S., M. T. Read, T. H. Bressi, and M. Block. 2005. Targeted Followup Observations of Asteroids 2005 EY, 2005 TS<sub>45</sub>, 2005 UG, and 2005 UH, and Incidental Followup Observations of Asteroids 2002 HW, 2005 OW, 2005 QY<sub>151</sub>, 2005 SW<sub>4</sub>, and 2005 UH. In MPEC 2005-U54.

Descour, A. S., and J. V. Scotti. 2005. Discovery and Prediscovery Observations of Small Apollo Asteroid 2005 FG. In MPEC 2005-F16.

Descour, A. S., and J. V. Scotti. 2005. Discovery and Followup Observations of Amor Asteroid 2005 VH<sub>1</sub>. In MPEC 2005-V43.

Descour, A. S., and A. F. Tubbiolo. 2005. Followup Observations of Asteroids 1990 OS, 1998 SC<sub>15</sub>, 1999 MM, 2000 EA<sub>14</sub>, 2002 PM<sub>6</sub>, and (9162). In MPEC 2005-L67.

Descour, A. S., and A. F. Tubbiolo. 2005. Followup Observations of Asteroids 1998 QQ<sub>63</sub>, 2002 FG<sub>7</sub>, 2002 NY<sub>31</sub>, 2002 SQ, 2004 JW<sub>20</sub>, and 2004 YZ<sub>23</sub>. In MPEC 2005-M02.

Descour, A. S., and J. Yu. 2005. Discovery and Followup Observations of Small, Fast-Moving Amor Asteroid 2005 GT. In MPEC 2005-G15.

Gehrels, T. 2005. Followup Observations of Asteroids 2000 JG<sub>5</sub> and 2001 ME<sub>1</sub>. In MPEC 2005-G15.

- Gehrels, T., T. H. Bressi, and M. Block. 2005. Prediscovery Observations of Asteroid 2004 SB<sub>1</sub>, Targeted Followup Observations of Asteroids 2002 AV, 2002 LH<sub>3</sub>, 2005 LW<sub>39</sub>, and 2005 NG, and Incidental Followup Observations of Asteroid (6178). In MPEC 2005-N63.
- Gehrels, T., and T. H. Bressi. 2005. Followup Observations of Asteroids 2005 OJ<sub>3</sub>, 2005 UH<sub>1</sub>, 2005 UG<sub>3</sub>, (23714), and (54071). In MPEC 2005-U68.
- Gehrels, T., T. H. Bressi, and J. V. Scotti. 2005. Targeted Followup Observations of Asteroids 2003 UO<sub>25</sub>, 2005 SQ, 2005 TB<sub>15</sub>, 2005 TS<sub>15</sub>, 2005 UO, 2005 UL<sub>1</sub>, 2005 UG<sub>3</sub>, and 2005 UW<sub>3</sub>, and Incidental Followup Observations of Asteroid 2005 OW. In MPEC 2005-U73.
- Gehrels, T., J. A. Larsen, and J. V. Scotti. 2005. Incidental Prediscovery Observations of Asteroids 1995 SC<sub>1</sub> and 2005 EA<sub>60</sub> and Followup Observations of Asteroids 2004 XH<sub>29</sub>, 2005 JA<sub>22</sub>, and 2005 LO<sub>3</sub>. In MPEC 2005-L44.
- Gehrels, T., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2002 CZ<sub>9</sub> and 2002 RX<sub>211</sub>, and Incidental Followup Observations of Asteroid 1999 JA<sub>11</sub>. In MPEC 2005-N08.
- Gehrels, T., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 1999 HD<sub>1</sub>, 2005 BX<sub>26</sub>, 2005 MM<sub>13</sub>, and Incidental Followup Observations of Asteroid 2005 EZ<sub>29</sub>. In MPEC 2005-N19.
- Gehrels, T., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 2005 QG<sub>30</sub> and 2005 RR<sub>6</sub>, and Incidental Followup Observations of Asteroid 2005 QX<sub>151</sub>. In MPEC 2005-R59.
- Gehrels, T., and M. T. Read. 2005. Targeted Followup Observations of Asteroid 2005 QG<sub>88</sub> and Incidental Followup Observations of Asteroid 2002 QY<sub>6</sub>. In MPEC 2005-R61.
- Gehrels, T., J. V. Scotti, and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2005 SP<sub>9</sub>, 2005 SN<sub>25</sub>, 2005 SZ<sub>70</sub>, 2005 TF<sub>50</sub>, 2005 UO, and 2005 UG<sub>3</sub>, and Incidental Followup Observations of Asteroid (90075). In MPEC 2005-U88.
- Gehrels, T., A. F. Tubbiolo, and M. T. Read. Prediscovery Observations of Large Amor Asteroid 2004 YJ<sub>32</sub>. In MPEC 2005-E37.
- Gehrels, T., and A. F. Tubbiolo. 2005. Followup Observations of Asteroids 1998 HL<sub>49</sub> and 2005 LO<sub>3</sub>. In MPEC 2005-L64.
- Gleason, A. E., J. V. Scotti, A. F. Tubbiolo, T. H. Bressi, and M. T. Read. 2005. Followup Observations of Asteroids 1999 MM, 2000 JH<sub>5</sub>, 2002 BA<sub>1</sub>, 2002 NY<sub>40</sub>, 2003 QW<sub>30</sub>, 2005 BX<sub>26</sub>, 2005 JA<sub>22</sub>, 2005 JJ<sub>91</sub>, (4487), and (11311). In MPEC 2005-K13.
- Gleason, A. E., and R. S. McMillan. 2005. Incidental Prediscovery Observations of Amor Asteroids 2005 MM<sub>13</sub> and 2005 TR<sub>45</sub>. In MPEC 2005-W18.
- Larsen, J. A. 2005. Incidental Prediscovery Observations of Large Apollo Asteroid 2004 JN<sub>13</sub>. In MPEC 2005-G68.
- McMillan, R. S. 2005. Followup Observations of Potentially Hazardous Virtual Impactor Apollo Asteroid 2005 EM<sub>30</sub>, and Incidental Followup of Asteroids 2000 OJ<sub>8</sub> and 2002 GT. In MPEC 2005-E44.
- McMillan, R. S. 2005. Incidental Followup Observations of Asteroid 2002 GT. In MPEC 2005-E57.
- McMillan, R. S. 2005. Discovery and Followup Observations of Small Apollo Asteroid 2005 EH<sub>94</sub>. In MPEC 2005-E59.

- McMillan, R. S. 2005. Incidental Followup Observations of Asteroids 2002 AV<sub>4</sub>, 2002 FW<sub>5</sub>, and 2002 GF<sub>1</sub>, and Followup Observations of Former Virtual Impactor Asteroid 2005 EG<sub>94</sub> and Small Fast-Moving Asteroid 2005 GT. In MPEC 2005-G17.
- McMillan, R. S. 2005. Discovery of Large, Potentially Hazardous Apollo Asteroid 2005 GE<sub>59</sub>. In MPEC 2005-G60.
- McMillan, R. S. 2005. Incidental Followup Observations of Asteroids 1998 MQ, 2001 HG<sub>31</sub>, and 2002 GF<sub>1</sub>. In MPEC 2005-J15.
- McMillan, R. S. 2005. Incidental Followup Observations of Asteroids 2002 GF<sub>1</sub>, 2002 RS<sub>28</sub>, and (13553). In MPEC 2005-J33.
- McMillan, R. S. 2005. Incidental Prediscovery Observations of Periodic Comet P/2005 JY<sub>126</sub>. In MPEC 2005-L36.
- McMillan, R. S. 2005. Incidental Followup Observations of Asteroid 2005 HA<sub>8</sub>. In MPEC 2005-M62.
- McMillan, R. S. 2005. Incidental Followup Observations of Periodic Comet P/2005 L1 (McNaught). In MPEC 2005-N14.
- McMillan, R. S. 2005. Incidental Followup Observations of Comet P/2005 S2 (Skiff). In MPEC 2005-T26.
- McMillan, R. S. 2005. Incidental Followup Observations of Asteroid 1998 MZ. In MPEC 2005-T40.
- McMillan, R. S. 2005. Discovery of Large Amor Asteroid 2005 UP<sub>156</sub>. In MPEC 2005-V11.
- McMillan, R. S. 2005. Incidental Followup Observations of Periodic Comet P/2005 U1 (Read). In MPEC 2005-W26.
- McMillan, R. S., T. H. Bressi, and A. S. Descour. 2005. Discovery and Followup Observations of Amor Asteroid 2005 VU<sub>5</sub>. In MPEC 2005-V78.
- McMillan, R. S., A. S. Descour, and J. A. Larsen. 2005. Incidental Followup Observations of Asteroids (4179) and (7753) in 2004. In MPEC 2005-C48.
- McMillan, R. S., A. S. Descour, J. V. Scotti, T. H. Bressi. 2005. Discovery and Followup Observations of Centaur or Scattered-Disk Object 2005 TJ<sub>50</sub>. In MPEC 2005-T86.
- McMillan, R. S., and A. S. Descour. 2005. Incidental Followup Observations of Periodic Comet P/2005 U<sub>1</sub> (Read). In MPEC 2005-V24.
- McMillan, R. S., and A. S. Descour. 2005. Incidental Followup Observations of Periodic Comet 65P. In MPEC 2005-V25.
- McMillan, R. S., and A. S. Descour. 2005. Targeted Followup Observations of Asteroids 2001 RQ<sub>3</sub>, 2002 VE<sub>68</sub>, 2002 YQ<sub>5</sub>, 2004 VA<sub>1</sub>, 2004 XN<sub>14</sub>, 2005 TG, and 2005 UH<sub>6</sub>. In MPEC 2005-V84.
- McMillan, R. S., S. B. Pope, and A. S. Descour. 2005. Discovery and Followup Observations of Small, Fast-Moving Amor Asteroid 2005 ME<sub>5</sub>. In MPEC 2005-M59.
- McMillan, R. S., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 2005 PY<sub>16</sub>, 2005 QQ<sub>11</sub>, 2005 QP<sub>87</sub>, 2005 SW<sub>4</sub>, and 2005 SX<sub>4</sub>, and Incidental Followup Observations of Asteroids 2005 QX<sub>151</sub> and 2005 SR<sub>1</sub>. In MPEC 2005-S77.
- McMillan, R. S., M. T. Read, and J. V. Scotti. 2005. Targeted Followup Observations of Asteroids 1994 CJ<sub>1</sub>, 1998 WT<sub>30</sub>, 2002 XG<sub>4</sub>, 2005 GQ<sub>21</sub>, 2005 QG<sub>30</sub>, 2005 QZ<sub>151</sub>, 2005 RW<sub>3</sub>, and

2005 SP<sub>1</sub>, and Incidental Followup Observations of Asteroids 2002 BY and 2005 SW<sub>4</sub>. In MPEC 2005-T02.

McMillan, R. S., and J. V. Scotti. 2005. Incidental Observations of Asteroids 2004 QZ<sub>2</sub> and (5646). In MPEC 2005-E71.

McMillan, R. S., and J. V. Scotti. 2005. Incidental Followup Observations of Comets C/2000 SV<sub>74</sub>, C/2004 X<sub>3</sub>, and 99P. In MPEC 2005-E90.

McMillan, R. S., and J. V. Scotti. 2005. Discovery and Followup Observations of Large Apollo Asteroid 2005 GN<sub>59</sub>. In MPEC 2005-G63.

McMillan, R. S., and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-moving Apollo Asteroid 2005 UL<sub>6</sub>. In MPEC 2005-U96.

McMillan, R. S., and J. V. Scotti. 2005. Discovery and Followup Observations of Potentially Hazardous Apollo Asteroid 2005 UW<sub>6</sub>. In MPEC 2005-U102.

McMillan, R. S., and J. V. Scotti. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 UR<sub>64</sub>. In MPEC 2005-V04.

McMillan, R. S., L. Sheng, and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-moving Aten Asteroid 2005 UV<sub>64</sub>. In MPEC 2005-V07.

McMillan, R. S., and A. F. Tubbiolo. 2005. Followup Astrometry of Asteroids 2004 NL<sub>8</sub>, 2004 VD<sub>17</sub>, and 2004 XO<sub>14</sub>. In MPEC 2005-A42.

Read, M. T. 2005. Incidental Followup Observations of Potentially Hazardous Aten Asteroid 2005 AY<sub>28</sub>. In MPEC 2005-B05.

Read, M. T. 2005. Discovery of Apollo Asteroid 2005 BE<sub>2</sub>. In MPEC 2005-B31.

Read, M. T. 2005. Incidental Followup Observations of Comet 99P. In MPEC 2005-B48.

Read, M. T. 2005. Incidental Followup Observations of Periodic Comet P/2005 L<sub>4</sub> (Christensen). In MPEC 2005-M30.

Read, M. T. 2005. Incidental Followup Observations of Asteroid 1999 NB<sub>5</sub>. In MPEC 2005-N41.

Read, M. T. 2005. Incidental Followup Observations of Asteroids 1999 JA<sub>11</sub> and (3352). In MPEC 2005-N42.

Read, M. T. 2005. Discovery Observations of Apollo Asteroid 2005 QG<sub>88</sub>. In MPEC 2005-R08.

Read, M. T. 2005. Incidental Followup Observations of Apollo Asteroid 2002 HW. In MPEC 2005-U17.

Read, M. T. 2005. Incidental Followup Observations of Comet C/2005 R<sub>4</sub>. In MPEC 2005-W83.

Read, M. T., and M. Block. 2005. Incidental Followup Observations of Asteroids (3908), (22771), and (26760). In MPEC 2005-C43.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Amor Asteroid 2005 JJ<sub>91</sub>. In MPEC 2005-J58.

Read, M. T., and M. Block. 2005. Incidental Followup Observations of Comet 2P. In MPEC 2005-R21.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Amor Asteroid 2005 UE. In MPEC 2005-U23.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 UG. In MPEC 2005-U25.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 UH. In MPEC 2005-U26.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Large Amor Asteroid 2005 UK. In MPEC 2005-U27.

Read, M. T., M. Block, T. H. Bressi, T. Gehrels, J. V. Scotti. 2005. Discovery and Followup Observations of Comet P/2005 U<sub>1</sub> (Read). In MPEC 2005-U74.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Amor Asteroid 2005 VY<sub>3</sub>. In MPEC 2005-V59.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Small, Fast-moving Apollo Asteroid 2005 WY. In MPEC 2005-W39.

Read, M. T., and M. Block. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 WC<sub>2</sub>. In MPEC 2005-W46.

Read, M. T., P. A. Bednarek, T. H. Bressi, and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-moving Apollo Asteroid 2005 QK<sub>76</sub>. In MPEC 2005-Q57.

Read, M. T., E. Bogucka, J. V. Scotti, T. H. Bressi. 2005. Recovery and Followup Observations of Small Amor Asteroid 2005 TD<sub>49</sub>. In MPEC 2005-T62.

Read, M. T., and T. H. Bressi. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 QG<sub>30</sub>. In MPEC 2005-Q54.

Read, M. T., and T. H. Bressi. 2005. Prediscovery Observations of Periodic Comet P/2005 S2 (Skiff). In MPEC 2005-T76.

Read, M. T., and T. H. Bressi. 2005. Discovery and Followup Observations of Large Apollo Asteroid 2005 UH<sub>3</sub>. In MPEC 2005-U59.

Read, M. T., S. Ding, and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-Moving Apollo Asteroid 2005 QQ<sub>87</sub>. In MPEC 2005-R04.

Read, M. T., C. M. Fu, and M. Block. 2005. Discovery and Followup Observations of Fast-moving Apollo Asteroid 2005 WB<sub>1</sub>. In MPEC 2005-W38.

Read, M. T., and T. Gehrels. 2005. Rediscovery Observations of Potentially Hazardous Amor Asteroid 1994 CJ<sub>1</sub>. In MPEC 2005-R60.

Read, M. T., D. J. Higgins, and T. H. Bressi. 2005. Discovery and Followup Observations of Small, Fast-moving Amor Asteroid 2005 UL<sub>1</sub>. In MPEC 2005-U52.

Read, M. T., S. Kürti, and J. V. Scotti. 2005. Discovery and Followup Observations of Small, Fast-Moving Amor Asteroid 2005 QP<sub>87</sub>. In MPEC 2005-R03.

Read, M. T., S. Kürti, and M. Block. 2005. Discovery and Followup Observations of Small, Fast-moving Apollo Asteroid 2005 UF. In MPEC 2005-U24.

Read, M. T., and J. A. Larsen. 2005. Prediscovery and Discovery Observations of Large Apollo Asteroid 2005 BY<sub>1</sub>. In MPEC 2005-B27.

Read, M. T., S. A. Radaelli, J. V. Scotti, A. S. Descour, and M. Block. 2005. Discovery and Followup Observations of Fast-Moving, Small Aten Asteroid 2005 TE<sub>49</sub>. In MPEC 2005-T63.

Read, M. T., and J. V. Scotti. 2005. Discovery and Followup Observations of Comet C/2005 S3 (Read). In MPEC 2005-T11.

Read, M. T., J. V. Scotti, T. H. Bressi. 2005. Discovery and Followup Observations of Periodic Comet P/2005 T3 (Read). In MPEC 2005-T67.

Read, M. T., and A. F. Tubbiolo. 2005. Discovery and Followup Observations of Small Apollo Asteroid 2005 AZ<sub>28</sub>. In MPEC 2005-B06.



Read, M. T., and A. F. Tubbiolo. 2005. Discovery and Followup Observations of Potentially Hazardous Aten Asteroid 2005 BO<sub>1</sub>. In MPEC 2005-B18.

Read, M. T., and A. F. Tubbiolo. 2005. Incidental Followup Observations of Asteroids 1998 FM<sub>5</sub>, 1998 HL<sub>49</sub>, 1998 MQ, and (5646). In MPEC 2005-J44.

Scotti, J. V. 2005. Incidental Followup Observations of Comet 158P. In MPEC 2005-C05.

Scotti, J. V. 2005. Incidental Followup Observations of Asteroids 2002 LJ<sub>3</sub>, (22753), and (68063). In MPEC 2005-C09.

Scotti, J. V. 2005. Recovery of Large Apollo Asteroid 1990 SM which allowed linkage to 1987 SB<sub>4</sub>. In MPEC 2005-C25.

Scotti, J. V. 2005. Incidental Followup Observations of Asteroid 2005 CM. In MPEC 2005-C20.

Scotti, J. V. 2005. Discovery of Small Amor Asteroid 2005 EX<sub>169</sub>. In MPEC 2005-E81.

Scotti, J. V. 2005. Incidental Followup of Asteroid 1999 DK<sub>3</sub>. In MPEC 2005-E78.

Scotti, J. V. 2005. Followup Observations of Comet C/2000 SV<sub>74</sub>. In MPEC 2005-G80.

Scotti, J. V. 2005. Incidental Followup Observations of Asteroid 1999 HD<sub>1</sub>. In MPEC 2005-J31.

Scotti, J. V. 2005. Incidental Followup Observations of Asteroid (5626). In MPEC 2005-L46.

Scotti, J. V. 2005. Followup Observations of Periodic Comet P/2004 DO<sub>29</sub> (Spacewatch-LINEAR). In MPEC 2005-N45.

Scotti, J. V. 2005. Targeted Followup Observations of Asteroid 2005 TB. In MPEC 2005-T34.

Scotti, J. V. 2005. Targeted Followup Observations of Asteroid 2005 TB<sub>15</sub>. In MPEC 2005-T58.

Scotti, J. V. 2005. Targeted Followup Observations of Small Amor Asteroid 2005 UF<sub>5</sub>. In MPEC 2005-U75.

Scotti, J. V. 2005. Targeted Followup Observations of Large Amor Asteroid 2005 UY<sub>5</sub>. In MPEC 2005-U89.

Scotti, J. V. 2005. Targeted Followup Observations of Small Apollo Asteroid 2005 US<sub>6</sub>. In MPEC 2005-U99.

Scotti, J. V. 2005. Targeted Followup Observations of Apollo Asteroid 2005 UY<sub>6</sub>. In MPEC 2005-U103.

Scotti, J. V. 2005. Targeted Followup Observations of Periodic Comet P/2005 T<sub>3</sub> (Read). In MPEC 2005-V21.

Scotti, J. V. 2005. Targeted Followup Observations of Apollo Asteroid 2005 UN<sub>157</sub>. In MPEC 2005-V28.

Scotti, J. V. 2005. Targeted Followup Observations of Large Apollo Asteroid 2005 VC. In MPEC 2005-V31.

Scotti, J. V. 2005. Targeted Followup Observations of Retrograde Centaur or Scattered Disk Object 2005 VD. In MPEC 2005-V32.

Scotti, J. V. 2005. Targeted Followup Observations of Small Apollo Asteroid 2005 WG<sub>4</sub>. In MPEC 2005-W76.

Scotti, J. V. 2005. Targeted Followup Observations of Asteroids 2005 OJ<sub>03</sub>, 2005 TS<sub>15</sub>, 2005 UH<sub>6</sub>, and 2005 VT<sub>2</sub>. In MPEC 2005-W84.

Scotti, J. V. 2005. Targeted Followup Observations of Amor Asteroid 2005 WE<sub>55</sub>. In MPEC 2005-W88.

Scotti, J. V., and M. Block. 2005. Followup Observations of Asteroids 1999 MM, 1999 YR<sub>14</sub>, 2000 JG<sub>5</sub>, 2001 ME<sub>1</sub>, 2002 CQ<sub>11</sub>, and 2005 GE<sub>59</sub>. In MPEC 2005-J50.

Scotti, J. V., and M. Block. 2005. Followup Observations of Asteroids 1998 HL<sub>49</sub>, 2001 NH<sub>6</sub>, 2002 LV, 2002 SR<sub>41</sub>, 2005 JS<sub>108</sub>, 2005 KP<sub>9</sub>, (9162), and (13553). In MPEC 2005-L18.

Scotti, J. V., and M. Block. 2005. Targeted Followup Observations of Asteroids 2005 EY<sub>223</sub>, 2005 JA<sub>22</sub>, 2005 LX<sub>36</sub>, and 2005 MR<sub>5</sub>, and Incidental Followup Observations of Asteroids 2005 ND<sub>7</sub> and (31210). In MPEC 2005-N56.

Scotti, J. V., M. Block, and A. S. Descour. 2005. Targeted Followup Observations of Asteroids 1992 HF, 2005 MP<sub>13</sub>, 2005 SH<sub>26</sub>, 2005 TB<sub>15</sub>, 2005 TS<sub>15</sub>, 2005 TF<sub>50</sub>, 2005 UE<sub>3</sub>, 2005 UH<sub>6</sub>, and 2005 UL<sub>6</sub>, and Incidental Followup Observations of Asteroids 2005 UL<sub>6</sub>, 2005 UP<sub>156</sub>, and 2005 VA. In MPEC 2005-V49.

Scotti, J. V., and T. H. Bressi. 2005. Recovery Observations of Amor Asteroid 2003 AZ<sub>2</sub>. In MPEC 2005-B23.

Scotti, J. V., and T. H. Bressi. 2005. Discovery and Followup Observations of Small Apollo Asteroid 2005 GD<sub>60</sub>. In MPEC 2005-G69.

Scotti, J. V., and A. S. Descour. 2005. Followup Observations of Amor Asteroid 2005 JP<sub>81</sub>. In MPEC 2005-J52.

Scotti, J. V., and A. S. Descour. 2005. Targeted Followup Observations of Asteroids 2005 TE<sub>15</sub>, 2005 TG<sub>50</sub>, 2005 UG, 2005 UH, 2005 UO, and 2005 UH<sub>6</sub>, and Incidental Observations of Asteroids 2002 T<sub>55</sub>, (7358), and (90075). In MPEC 2005-V10.

Scotti, J. V., and A. S. Descour. 2005. Targeted Followup Observations of Asteroids 2005 UE<sub>3</sub> and 2005 VC, and Incidental Followup Observations of Asteroids 1994 CC, 1999 VL<sub>12</sub>, and 2002 HK<sub>12</sub>. In MPEC 2005-W74.

Scotti, J. V., S. Foglia\*, and A. S. Descour. 2005. Discovery of Small Fast-moving Amor Asteroid 2005 CK. In MPEC 2005-C16. \*Corrigendum

Scotti, J. V., T. J. Hoffman, R. S. McMillan, M. T. Read. 2005. Discovery & Followup Observations of Small Apollo Asteroid 2005 JB<sub>22</sub>. In MPEC 2005-J35.

Scotti, J. V., M. Langbroek, and T. H. Bressi. 2005. Discovery and Followup Observations of Small, Fast-Moving Amor Asteroid 2005 GG<sub>81</sub>. In MPEC 2005-G73.

Scotti, J. V., and R. S. McMillan. 2005. Discovery of Apollo Asteroid 2005 CV<sub>25</sub>. In MPEC 2005-C28.

Scotti, J. V., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroid 2003 BO<sub>1</sub>, and Incidental Followup Observations of Asteroids 2001 FZ<sub>6</sub>, 2005 QE<sub>166</sub>, 2005 SX<sub>4</sub>, 2005 SJ<sub>19</sub>, (3361), (11284), and (85628). In MPEC 2005-T13.

Scotti, J. V., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2004 GU<sub>9</sub>, 2005 RP<sub>6</sub>, 2005 SQ, 2005 SP<sub>1</sub>, and 2005 SE<sub>71</sub>, and Incidental Followup Observations of Asteroid (66251). In MPEC 2005-T22.

Scotti, J. V., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2001 PJ<sub>9</sub>, 2005 NY<sub>39</sub>, 2005 TF<sub>50</sub>, 2005 UO, 2005 UA<sub>1</sub>, 2005 UK<sub>1</sub>, 2005 UW<sub>3</sub>, 2005 UG<sub>5</sub>, and 2005 UM<sub>5</sub>, and Incidental Followup Observations of Asteroid 1999 YB. In MPEC 2005-U93.

Scotti, J. V., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2005 UM<sub>5</sub> and 2005 UZ<sub>5</sub>, and Incidental Followup Observations of Asteroid 2002 TW<sub>55</sub>. In MPEC 2005-V01.

- Scotti, J. V., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2005 SH<sub>19</sub>, 2005 UK, 2005 UL<sub>6</sub>, and 2005 UY<sub>6</sub>, and Incidental Followup Observations of Asteroids 2005 TR<sub>15</sub> and 2005 UM<sub>5</sub>. In MPEC 2005-V27.
- Scotti, J. V., and R. S. McMillan. 2005. Targeted Followup Observations of Comet 53P and Incidental Followup Observations of Comets 60P and 172P. In MPEC 2005-V95.
- Scotti, J. V., and R. S. McMillan. 2005. Targeted Followup Observations of Asteroids 2003 WO<sub>151</sub>, 2005 TB<sub>15</sub>, 2005 VT<sub>2</sub>, and 2005 WC<sub>2</sub>, and and Incidental Followup Observations of Asteroid 2005 WY<sub>55</sub>. In MPEC 2005-W93.
- Scotti, J. V., and M. T. Read. 2005. Followup Observations of Asteroids 1996 AJ<sub>1</sub>, 2002 CZ<sub>9</sub>, and 2004 SW<sub>55</sub>. In MPEC 2005-A27.
- Scotti, J. V., and M. T. Read. 2005. Incidental Followup Observations of Periodic Comet P/2005 JD<sub>108</sub> (Catalina-NEAT). In MPEC 2005-N49.
- Scotti, J. V., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 2005 SQ and 2005 SP<sub>1</sub>, and Incidental Followup Observations of Asteroids 2003 EF<sub>54</sub>, (3361), and (90373). In MPEC 2005-T45.
- Scotti, J. V., and M. T. Read. 2005. Targeted Followup Observations of Asteroid 2005 TE<sub>15</sub> and Incidental Observations of Asteroids 1994 UG and 2005 SQ. In MPEC 2005-T51.
- Scotti, J. V., and M. T. Read. 2005. Targeted Followup Observations of Asteroids 1992 BA, 2003 RN<sub>10</sub>, 2005 TE<sub>15</sub>, 2005 UP<sub>156</sub>, and 2005 VH<sub>1</sub>, and Incidental Followup Observations of Asteroids 1998 VO<sub>33</sub> and 2005 UE. In MPEC 2005-W62.
- Spahr, T. 2005. Remeasurement of Spacewatch Observations of Potentially Hazardous and Virtual Impactor Aten Asteroid 2004 MN<sub>4</sub>. In MPEC 2005-C33.
- Tubbiolo, A. F. 2005. Incidental Followup Observations of Apollo Asteroid 2004 LB<sub>6</sub>. In MPEC 2005-C61.
- Tubbiolo, A. F. 2005. Incidental Followup Observations of Asteroids 2004 EP<sub>20</sub> and (22771). In MPEC 2005-E05.
- Tubbiolo, A. F. 2005. Incidental Followup Observations of Comet 99P. In MPEC 2005-E11.
- Tubbiolo, A. F. 2005. Incidental Followup Observations of Asteroids 1997 EH<sub>29</sub>, 2004 EW, (4179), and (16912). In MPEC 2005-E24.
- Tubbiolo, A. F. 2005. Discovery and Followup Observations of Comet C/2005 E<sub>1</sub> (Tubbiolo). In MPEC 2005-E35.
- Tubbiolo, A. F. 2005. Incidental Followup Observations of Comet 105P/Singer Brewster. In MPEC 2005-E41.
- Tubbiolo, A. F. 2005. Incidental Followup Observations of Asteroid 2005 EA<sub>60</sub>. In MPEC 2005-E41.
- Tubbiolo, A. F. 2005. Incidental Followup Observations of Periodic Comet P/2005 L<sub>1</sub> (McNaught). In MPEC 2005-M28.
- Tubbiolo, A. F., Bressi, T. H., and Read, M. T. 2005. Followup Observations of Asteroids 2004 QZ<sub>2</sub>, 2004 QB<sub>17</sub>, 2004 VG<sub>64</sub>, 2004 XO<sub>14</sub>, 2005 AY<sub>28</sub>, and (6569). In MPEC 2005-B19.
- Tubbiolo, A. F., and A. S. Descour. 2005. Discovery and Followup Observations of Small Apollo Asteroid 2005 LQ<sub>40</sub>. In MPEC 2005-M05.
- Tubbiolo, A. F., and A. S. Descour. 2005. Discovery and Followup Observations of Amor Asteroid 2005 LZ<sub>42</sub>. In MPEC 2005-M08.

- Tubbiolo, A. F., J. J. Gomez, T. H. Bressi, and M. T. Read. 2005. Discovery and Followup Observations of Small, Fast-moving Aten Asteroid 2005 QP11. In MPEC 2005-Q46.
- Tubbiolo, A. F., and T. H. Bressi. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 QQ<sub>11</sub>. In MPEC 2005-Q47.
- Tubbiolo, A. F., and R. S. McMillan. 2005. Discovery and Followup Observations of Small Amor Asteroid 2005 AO<sub>19</sub>. In MPEC 2005-A45.
- Tubbiolo, A. F., and R. S. McMillan. 2005. Discovery and Followup Observations of Amor Asteroid 2005 AQ<sub>19</sub>. In MPEC 2005-A46.
- Tubbiolo, A. F., and M. T. Read. 2005. Followup Observations of Asteroids 2002 AV<sub>31</sub>, 2004 VD<sub>17</sub>, and (5189). In MPEC 2005-B10.